LOWER LLAGAS CREEK
REACH 3A-5
1991
DESIGN REPORT

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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

DESIGN SECTION

DAVIS, CALIFORNIA

DESIGN REPORT

FOR

LOWER LLAGAS CREEK REACH 3A-5

JULY 1991

LOWER LLAGAS CREEK REACH 3A-5
DESIGN REPORT

Job:	Lower Llagas Creek Reach 3A-5
Project:	Lower Llagas Creek Watershed Project
Location:	Gilroy, California
Authority:	PL-566

Summary

This report represents the final design and channel alignment layout of Lower Llagas Creek Reach 3A-5. The hydraulic design is based on channel capacity and stability requirements. The design flows were presented in the Watershed Work Plan documentation.

Description of Job

The Llagas Creek Project provides watershed protection through channel improvements and through the installation of structural measures. This project consists of Reach 3A-5.

This reach consists of the finish excavation of 0.5 mile of earthen channel. Rough excavation of this reach was done as part of previous freeway construction. One grouted rock drop will be used to stabilize this reach by decreasing the channel gradient. The installation of a low flow channel and appropriate fish passage measures will be included to accommodate migratory fish. Riparian vegetation will be restored in areas of disturbance and replaced in most areas of removal.

This reach is designed to provide existing capacity plus capacity to preclude induced flooding from upstream work.

Job Classification

This is a class VII job.

The limiting design flow for channels in Earth delegated to California Design Approval is 5,000 cfs (bank full capacity). The maximum design flow for this project is a bank full flow of 9,850 cfs.

Design Objective

The purpose of this design is to develop the channel alignment, cross section, and drop structures which will provide stability and capacity.

Basis of Design

1. National Handbook of Conservation Practices
2. TR-25; Design of Open Channels
3. NEH-5; Hydraulics
4. Chow, Open Channel Hydraulics
5. Llagas Creek Watershed, Environmental Impact Statement/Report
6. Lower Llagas Creek Watershed Work Plan
7. Llagas Creek Reaches 2B, 3A & 9, 3A-2 and 3A-2 Supplemental Design Reports
8. U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams
9. Soil Conservation Service, Far West States
10. ASCE Hydraulics Journal
11. U.S. Department of the Interior, Engineering Monograph No. 25, Hydraulic Design of Stilling Basis and Energy Dissipators
12. Geologic Report for LLagas Creek Reach 3 and 9, SCS, by Jerald M. Curry
13. Soil Mechanic Report for Llagas Creek Reach 3 and 9, SCS, by Tom Smith

Design Narrative

General: The design of this reach meets criteria set forth in NHCP Grade Stabilization Structure (410), NHCP Open Channel (582), and NHCP Stream Channel Stabilization (584).

1. LOCATION AND LAYOUT

The alignment of this reach has been developed to best fit the existing right-of-way owned by Santa Clara Valley Water District

2. HYDROLOGY

The hydrology for this reach is provided in the Watershed Work Plan

The design flow for the capacity of this reach is the bank full flow of Reach 3A-4 (9,850 cfs).

3. HYDRAULIC DESIGN

The hydraulic design of this reach is primarily based on the requirements of TR-25 - Design of Open Channels. The foremost considerations of this design are Flood Water Protection, Channel Stability, Environmental Conformance, Land Rights, and Channel Maintenance.

The design objective for discharge according to supplement no. 2 to the Lower Llagas Creek Watershed Work Plan was to provide "existing capacity plus capacity to preclude induced flooding from upstream work". This means the capacity of the existing channel excavated by Cal Trans assuming upstream improvements in place. No further enlargement for additional flood capacity was planned. This design flow is given in table 3A of the supplement to be 8,100 cfs.

The design discharge (8,100 cfs) and bankfull discharge (9,850 cfs) provided are the same as that provided for Reach 3A-4. No specific level of protection was assigned to this discharge in the workplan supplement. It has generally been accepted that 8,100 cfs is about a ten year frequency event. However, there are no flood protection benefits in this reach. The work involved is strictly mitigation and stabilization according to the work plan. Freeboard for the 8,100 cfs is therefore not needed. However, since the bankfull capacity of Reach 3A-2 is 9,850 cfs, a " freeboard flow" of 9,850 cfs will be used as the bank full flow capacity of this reach.

The drop structure is hydraulically designed as a chute with a basin sufficiently long to contain the hydraulic jump. The drop structure is located to minimize channel excavation. There is one drop structure in this reach.

The channel is benched on both sides to provide a maintenance road and a landscaping area.

The computer program "Overbank" was used to calculate the water water surface profiles. "Overbank" was developed in the California State Design Office by Donald Twiss. This program calculates water surface profiles for steady, gradually varied flow in trapezoidal channels with benches that cause overbank flow.

4. CHANNEL STABILITY

The stability of the channel was calculated based on the methods described in TR-25, Design of Open Channels. The tractive power method was used to determine channel stability. Design values for soil parameters were taken from the Soil Mechanics Report.

In accordance with a previous hydraulic review, a seeding mix which included a sod type of grass (Luna pubescent wheatgrass) was applied to the channel slopes of Reach 3A-3 to improve channel stability. This grass failed to establish itself. Perennials cannot survive on the side slopes because of the local climate. Wheatgrass has therefore been deleted from the seeding mixture in the vegetative specification. The chute width at the crest of the drop structure has been narrowed to reduce upstream velocities.

If sand and silt lenses are encountered during construction, loose rock riprap or grouted rock riprap will be used to protect the slope and/or invert. Additional soil investigation may be needed during construction to determine the extent of the sand/silt lenses.

5. BANK STABILITY

The SB-SLOPE slope stability program was used to determine if the stability of the bank slopes were adequate.

There are no levees at the top of the channel slopes. Failure of any slope would not cause the channel flow to escape.

6. APPURTENANCES - SPECIAL FEATURES

(a) Fish Runs

This reach has existing fish habitat. The planned channel cross-section has a low flow channel. A fish ladder is required to allow passage of migratory fish through the drop structure. The Denil type of fish ladder was requested by the California Department of Fish and Game.

____
Submitted By: Civil Engineer

____
Recommended By: State Design Engineer

____ __________
Approved By: State Conservation Engineer Date

2. LOCATION AND LAYOUT

HORIZONTAL AND VERTICAL CONTROL

The alignment for Reach 3A-4 was previously determined by the California Department of Tranportation (Caltrans). Caltrans roughly excavated Reach 3A-4 to obtain borrow material for freeway construction.

Minor variations in stationing and curve data have been made to the original Caltrans alignment.

Coordinates for horizontal control have been derived from those shown on Caltrans Project Plans For Contract No. 04-117334. Horizontal control points in the field were furnished be Santa Clara Valley Water District survey crews.

Vertical control is based on a U.S.C.& G.S. brass disc set in concrete on the easterly side of Holsclaw Road near the junction of Holsclaw Road and Highway 52. A 1977 adjusted elevation of 182.85 was provided by the Santa Clara Valley Water District staff.

The elevation of 209.71 for brass cap #301 located on the S.W. corner of the Leavesley Avenue bridge deck was set by an SCS survey crew. This elevation was based on the U.S.C.&G.S. monument described above.

Elevations in this area may be decreasing due to ground subsidence caused by groundwater pumping.

LEAVESLEY AVE. VICINITY

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       STATION                      COORDINATES                                  CURVE INFORMATION

     PI 13 TO PI 14        BEARING    N 53 17 25.0 E        DIST.  686.7205

B.C. STA.    245+60.92     N    190,953.165       E 1,695,718.0417          PI 14 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  99 40 53.0                   LONG CHORD 458.5526
           PI 14           N    191,165.6773      E 1,696,003.0480          R  300.0000                       PI OFFSET  165.1775
                                                                            T  355.5139                       DEFL/100'  19.0906
E.C. STA.    250+82.85     N    191,410.8867      E 1,695,745.6329          L 521.9305                        DEFL/50'    9.549

     PI 14 TO PI 15        BEARING    N 46 23 28.0 W        DIST.  582.8754

B.C. STA.    250+82.85     N    191,410.887       E 1,695,745.6329          PI 15 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  38 33 30.0                   LONG CHORD 429.2226
           PI 15           N    191,567.7052      E 1,695,581.0084          R  650.0000                       PI OFFSET   38.6169
                                                                            T  227.3615                       DEFL/100'   8.8147
E.C. STA.    255+20.28     N    191,792.9455      E 1,695,550.0232          L 437.4305                        DEFL/50'    4.407

     PI 15 TO PI 16        BEARING    N  7 49 57.9 W        DIST.  770.4733

B.C. STA.    258+92.96     N    192,162.148       E 1,695,499.2336          PI 16 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  22 40 33.0                   LONG CHORD 334.2117
           PI 16           N    192,330.9901      E 1,695,476.0068          R  850.0000                       PI OFFSET   16.9181
                                                                            T  170.4319                       DEFL/100'   6.7407
E.C. STA.    262+29.36     N    192,477.8263      E 1,695,389.4841          L 336.4029                        DEFL/50'    3.370

     PI 16 TO PI 17        BEARING    N 30 30 31.0 W        DIST. 1079.4581

B.C. STA.    269+44.44     N    193,093.906       E 1,695,026.4612          PI 17 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  57 59  4.0                   LONG CHORD 339.2837
           PI 17           N    193,261.0005      E 1,694,928.0008          R  350.0000                       PI OFFSET   50.1438
                                                                            T  193.9461                       DEFL/100'  16.3702
E.C. STA.    272+98.65     N    193,433.0705      E 1,695,017.4826          L 354.2068                        DEFL/50'    8.185

     PI 17 TO PI 18        BEARING    N 27 28 33.0 E        DIST. 1547.5510

B.C. STA.    284+79.37     N    194,480.612       E 1,695,562.2366          PI 18 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  25 57 41.0                   LONG CHORD 336.9341
           PI 18           N    194,633.9962      E 1,695,642.0013          R  750.0000                       PI OFFSET   19.6683
                                                                            T  172.8850                       DEFL/100'   7.6394
E.C. STA.    288+19.21     N    194,806.8209      E 1,695,646.5705          L 339.8338                        DEFL/50'    3.820

     PI 18 TO PI 19        BEARING    N  1 30 52.0 E        DIST. 1286.4534

B.C. STA.    297+45.37     N    195,732.657       E 1,695,671.0480          PI 19 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  21 13 45.0                   LONG CHORD 368.4032
           PI 19           N    195,920.0003      E 1,695,676.0010          R 1000.0000                       PI OFFSET   17.4094
                                                                            T  187.4084                       DEFL/100'   5.7296
E.C. STA.    301+15.88     N    196,096.4236      E 1,695,612.7811          L 370.5190                        DEFL/50'    2.865

     PI 19 TO PI 20        BEARING    N 19 42 53.0 W        DIST. 1076.0692

B.C. STA.    307+88.46     N    196,729.580       E 1,695,385.8948          PI 20 CURVE DATA                  ADDITIONAL CURVE DATA
                                                                            DEL  24 23 10.0                   LONG CHORD 422.4125
           PI 20           N    196,932.9945      E 1,695,313.0027          R 1000.0000                       PI OFFSET   23.0790
                                                                            T  216.0807                       DEFL/100'   5.7296
E.C. STA.    312+14.08     N    197,088.1656      E 1,695,162.6271          L 425.6178                        DEFL/50'    2.865
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STATION		COORDINATES		CURVE INFORMATION	
PI 20 TO PI 21		BEARING N 44 6 3.0 W	DIST. 1622.2976		
B.C. STA.	324+62.79	N 197,984.885	E 1,694,293.6205	PI 21 CURVE DATA DEL 29 25 4.0	ADDITIONAL CURVE DATA LONG CHORD 304.6896
	PI 21	N 198,097.9928	E 1,694,184.0082	R 600.0000 T 157.5066	PI OFFSET 20.3292 DEFL/100' 9.5493
E.C. STA.	327+70.85	N 198,142.6780	E 1,694,032.9732	L 308.0623	DEFL/50' 4.775
PI 21 TO PI 22		BEARING N 73 31 7.0 W	DIST. 528.7291		
B.C. STA.	328+49.38	N 198,164.957	E 1,693,957.6699	PI 22 CURVE DATA DEL 88 35 14.0	ADDITIONAL CURVE DATA LONG CHORD 419.0013
	PI 22	N 198,247.9953	E 1,693,677.0035	R 300.0000 T 292.6925	PI OFFSET 119.1288 DEFL/100' 19.0986
E.C. STA.	333+13.23	N 198,530.6237	E 1,693,753.0964	L 463.8416	DEFL/50' 9.549
PI 22 TO PI 23		BEARING N 15 4 7.0 E	DIST. 888.5534		
B.C. STA.	335+79.83	N 198,788.057	E 1,693,822.4059	PI 23 CURVE DATA DEL 95 19 28.9	ADDITIONAL CURVE DATA LONG CHORD 443.5133
	PI 23	N 199,105.9960	E 1,693,908.0057	R 300.0000 T 329.2608	PI OFFSET 145.4353 DEFL/100' 19.0986
E.C. STA.	340+78.95	N 199,161.7217	E 1,693,583.4948	L 499.1190	DEFL/50' 9.549
PI 23 TO PI 24		BEARING N 80 15 22.0 W	DIST. 1471.2263		
B.C. STA.	347+37.02	N 199,273.097	E 1,692,934.9178	PI 24 CURVE DATA DEL 59 18 17.0	ADDITIONAL CURVE DATA LONG CHORD 841.0518
	PI 24	N 199,354.9932	E 1,692,458.0031	R 850.0000 T 483.8954	PI OFFSET 128.0874 DEFL/100' 6.7407
E.C. STA.	356+16.82	N 199,806.8955	E 1,692,204.9740	L 879.8034	DEFL/50' 3.370
PI 24 TO PI 25		BEARING N 20 57 5.0 W	DIST. 763.4838		
B.C. STA.	356+32.42	N 199,821.464	E 1,692,279.3958	PI 25 CURVE DATA DEL 29 34 34.0	ADDITIONAL CURVE DATA LONG CHORD 510.4885
	PI 25	N 200,067.9986	E 1,692,185.0000	R 1000.0000 T 263.9884	PI OFFSET 34.2580 DEFL/100' 5.7296
E.C. STA.	361+48.62	N 200,235.8182	E 1,691,981.2195	L 516.2006	DEFL/50' 2.865
PI 25 TO PI 26		BEARING N 58 31 39.0 W	DIST. 550.5622		
B.C. STA.	362+46.69	N 200,298.162	E 1,691,905.5163	PI 26 CURVE DATA DEL 56 36 43.9	ADDITIONAL CURVE DATA LONG CHORD 331.9274
	PI 26	N 200,417.9954	E 1,691,760.0047	R 350.0000 T 188.5037	PI OFFSET 47.5344 DEFL/100' 16.3702
E.C. STA.	365+92.51	N 200,605.4371	E 1,691,779.9859	L 345.8243	DEFL/50' 8.185
PI 26 TO PI 27		BEARING N 6 5 5.0 E	DIST. 594.3491		
B.C. STA.	366+88.26	N 200,700.648 200,998.6516	E 1,691,790.1353 E 1,691,821.9023	PI 27 CURVE DATA ° ' " DEL ~~63 36 49.0~~ 63 55 03	ADDITIONAL CURVE DATA LONG CHORD ~~527.0568~~
	PI 27	N ~~201,008.9961~~	~~E 1,691,823.0051~~	R 500.0000 ✓ T ~~[illegible]~~ 299.692	PI OFFSET ~~88.3529~~ DEFL/100' ~~11.4592~~
E.C. STA.	~~372+43.40~~ 372+28.727	N ~~201,175.4783~~ 201,166.9617	E ~~1,691,861.3093~~ 1691573.9366	L ~~555.1236~~ 539.9665	DEFL/50' ~~5.730~~

STATION		COORDINATES			CURVE INFORMATION
PI 27 TO PI 28		BEARING ~~N 57 31 44.0 W~~ N55°49'58"W	DIST. ~~495.4658~~ 474.258		
B.C. STA.	~~373+41.86~~ 373+17.423	N ~~201,228.339~~ 201,217.0551	E ~~1,691,478.3823~~ 1691500.1356	PI 28 CURVE DATA ° ' "	ADDITIONAL CURVE DATA
				DEL ~~27 53 26.0~~ 27 24' 55"	~~LONG CHORD 168.6965~~
PI 28		N ~~201,274.9986~~ 201,265.000	E ~~1,691,404.9990~~ 1691429.500	R 350.0000 ✓	~~PI OFFSET 10.6290~~
				T ~~86.9098~~ 85.370	~~DEFL/100' 16.3702~~
E.C. STA.	~~375+12.23~~ 374+84.893	N ~~201,350.5378~~ 201,340.0830	E ~~1,691,362.0208~~ 1691388.8733	L ~~170.3737~~ 167.470	~~DEFL/50' 8.185~~
PI 28 TO PI 29		BEARING N ~~29 38 10.0 W~~ N28°25'03"W	DIST. ~~86.9098~~ 323.107		
PI 29 STA.	~~375+12.23~~ 378+08.00	N ~~201,350.5378~~ 201624.2566	E ~~1,691,362.0208~~ 1691235.1090	PI 29 DEFL. ANGLE 0 0 0.0	

"TIE IN" POINT AT D/S END BUENA VISTA BRIDGE STA. 377+31.54
N 201,557.0000
E 1,691,271.5000

3. HYDROLOGY

CA
DRH

LLAGAS CR. REACH 3A-5

6-22-91

HYDROLOGY/HYDRAULICS 1 1

LLAGAS CREEK REACH 3 (ALL SUBREACHES) WAS TO HAVE A 10YR STORM EVENT CAPACITY OF 8100CFS ACCORDING TO THE WORKPLAN SUPPLEMENT. THE SAME SUPPLEMENT ALSO STATES THAT CONSTRUCTION SHOULD BE LIMITED TO MITIGATION AND STABILIZATION.

REACH 3A-2 WAS DESIGNED USING 8100 CFS BUT WITH LESS THAN FULL FREEBOARD. THIS WAS EQUIVALENT TO A BANKFULL CAPACITY OF 9850 CFS. REACH 3A-3 AND 3A-4 WERE DESIGNED FOR A BANKFULL CAPACITY OF 9850 CFS (MATCHES 3A-2). REACH 3A-5 WILL BE DESIGNED FOR A BANKFULL CAPACITY OF 9850CFS.

USE CRITICAL DEPTHS FOR INITIAL DEPTHS TO DETERMINE WATER SURFACE ELEVATIONS. CRITICAL DEPTHS ARE LOCATED AT THE TOP OF THE DROP CONSTRUCTED FOR REACH 3A-4

STA.	FLOW	$d_c = d_i$	COMMENT
317+09.20	9850 CFS	11.54	CAPACITY
317+09.20	8100 CFS	10.37	STABILITY
317+09.20	5000 CFS	7.93	STABILITY

INCREASE BLEFT AND BRIGHT FOR HYDRAULIC PURPOSES TO ACCOUNT FOR ADDITIONAL CHANNEL AREA AVAILABLE BEYOND THE TYPICAL SECTION. SEE X-SECTIONS.

4. WATER SURFACE PROFILE

WATER SURFACE PROFILES

Design Flow

a. 9850 cfs-capacity
b. 8100 cfs-stability
c. 5000 cfs-stability

WATER SURFACE PROFILE FOR 9850 cfs

CAPACITY

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DATA FILE : SUB2CAPX                                                                                    PAGE : 1

              SUBCRITICAL WATER SURFACE PROFILE

                   LLAGAS CREEK REACH 3A-5

                       CAPACITY PROFILE

  COMPUTED BY:  D. HALLSTROM    DATE:   7/27/91    CHECKED BY:____________________ DATE:_____________

  STATION        Q          Dc        DEPTH       HE         AREA     VELOC     INV.EL    W.S.EL    ALPHA     F.B. EL

 [illegible]   9850.00     11.536     11.540    209.025     612.5    16.080    193.47    208.01    1.000     208.12
        Sf=0.006042    Headloss Factor=0.100   Total Headloss=0.343 ft.
 317+49.20     9850.00     11.614     13.273    209.367     792.7    12.426    193.49    206.76    1.086     209.94
        Sf=0.003194    Headloss Factor=0.100   Total Headloss=0.151 ft.
 [illegible]   9850.00     11.365     14.286    209.517    1012.9     9.724    193.50    207.79    1.179     210.99
        Sf=0.002297    Headloss Factor=0.100   Total Headloss=0.084 ft.
 [illegible]   9850.00     10.828     14.736    209.600    1170.1     8.418    193.51    208.25    1.231     211.46
        Sf=0.001692    Headloss Factor=0.100   Total Headloss=0.058 ft.
 [illegible]   9850.00     10.212     15.022    209.657    1308.3     7.529    193.52    208.54    1.267     211.77
        Sf=0.001334    Headloss Factor=0.100   Total Headloss=0.044 ft.
 [illegible]   9850.00      9.564     15.227    209.700    1436.5     6.857    193.53    208.76    1.292     211.99
        Sf=0.001027    Headloss Factor=0.100   Total Headloss=0.035 ft.
 [illegible]   9850.00      8.887     15.384    209.735    1558.5     6.320    193.54    208.92    1.308     212.16
        Sf=0.000964    Headloss Factor=0.100   Total Headloss=0.016 ft.
 [illegible]   9850.00      8.507     15.449    209.751    1621.9     6.073    193.55    209.00    1.312     212.24
        Sf=0.000845    Headloss Factor=0.100   Total Headloss=0.011 ft.
 [illegible] [illegible] [illegible] 15.430    209.763    1596.0     6.172    193.55    208.98    1.316     212.23
        [illegible]    Headloss Factor=0.100   Total Headloss=0.027 ft.
 [illegible] [illegible] [illegible] 15.383    209.790    1539.3     6.399    193.56    208.95    1.325     212.19
        [illegible]    Headloss Factor=0.100   Total Headloss=0.014 ft.
 [illegible] [illegible] [illegible] [illegible] [illegible] 1510.9  6.619    193.57  [illegible] [illegible]  212.17
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   STATION        Q            Dc          DEPTH        HE          AREA      VELOC      INV EL      W.S.EL     ALPHA     F.B. EL

          Sf=0.001175    Headloss Factor=0.100    Total Headloss=0.031 ft.
 31+19.20     9850.00        9.194        15.308     209.836      1457.4     6.759      193.58      208.89     1.337      212.14
          Sf=0.001301    Headloss Factor=0.100    Total Headloss=0.034 ft.
 31+39.20     9850.00        9.445        15.253     209.870      1403.6     7.018      193.59      208.84     1.344      212.10
          Sf=0.001421    Headloss Factor=0.100    Total Headloss=0.024 ft.
 [illegible]  9850.00        9.612        15.214     209.895      1368.8     7.196      193.60      208.81     1.349      212.07
          Sf=0.001469    Headloss Factor=0.100    Total Headloss=0.011 ft.
 31+59.20     9850.00        9.607        15.225     209.905      1371.2     7.183      193.60      208.82     1.349      212.09
          Sf=0.001456    Headloss Factor=0.100    Total Headloss=0.030 ft.
 31+79.20     9850.00        9.593        15.256     209.935      1378.2     7.147      193.61      208.87     1.348      212.13
          Sf=0.001426    Headloss Factor=0.100    Total Headloss=0.032 ft.
 [illegible]  9850.00        9.547        15.308     209.966      1400.2     7.034      193.62      208.93     1.350      212.20
          Sf=0.001351    Headloss Factor=0.100    Total Headloss=0.035 ft.
 32+12.20     9850.00        9.390        15.410     210.000      1448.7     6.799      193.63      209.04     1.338      212.31
          Sf=0.001282    Headloss Factor=0.100    Total Headloss=0.028 ft.
 [illegible]  9850.00        9.341        15.452     210.027      1465.1     6.723      193.64      209.09     1.334      212.37
          Sf=0.001241    Headloss Factor=0.100    Total Headloss=0.028 ft.
 [illegible]  9850.00        9.275        15.502     210.055      1490.3     6.609      193.65      209.15     1.331      212.43
          Sf=0.000860    Headloss Factor=0.100    Total Headloss=0.039 ft.
 [illegible]  9850.00        8.875        15.747     210.093      1549.5     6.357      193.66      209.41     1.094      212.69
          Sf=0.000843    Headloss Factor=0.000    Total Headloss=0.017 ft.
 [illegible]  9850.00        9.194        15.581     210.110      1527.0     6.451      193.67      209.25     1.330      212.54
          Sf=0.001159    Headloss Factor=0.000    Total Headloss=0.018 ft.
 [illegible]  9850.00        9.194        15.593     210.128      1528.6     6.444      193.68      209.27     1.330      212.56
DATA FILE : sub.CARX                                                                                             PAGE 1- 3
   STATION        Q            Dc          DEPTH        HE          AREA      VELOC      INV EL      W.S.EL     ALPHA     F.B. EL

          [illegible]    Headloss Factor=0.000    Total Headloss=0.448 ft.
 [illegible]  9850.00        9.364        15.802     210.576      1480.1     6.655      193.87      209.67     1.315      213.01
          [illegible]    Headloss Factor=0.000    Total Headloss=0.270 ft.
 [illegible]  [illegible]    [illegible]  16.060     210.845      1485.8     6.629      193.99      210.05     1.150      213.43
          [illegible]    [illegible]=0.000        Total Headloss=0.150 ft.
          Sf=0.000973     Headloss Factor=0.000     Total Headloss=0.369 ft.
[illegible]    9850.00          9.356         16.346       211.384       1608.5       6.530       194.27       210.62       1.161        214.04
          Sf=0.001027     Headloss Factor=0.000     Total Headloss=0.066 ft.
[illegible].00 9850.00          9.537         16.252       211.450       1496.4       6.582       194.30       210.65       1.332        213.98
          Sf=0.001056     Headloss Factor=0.000     Total Headloss=0.124 ft.
[illegible].00 9850.00          9.436         16.375       211.574       1512.3       6.513       194.36       210.74       1.272        214.18
          Sf=0.000986     Headloss Factor=0.000     Total Headloss=0.216 ft.
[illegible]9.20  9850.00        9.436         16.498       211.789       1528.2       6.445       194.47       210.97       1.274        214.43
          Sf=0.000979     Headloss Factor=0.000     Total Headloss=0.295 ft.
340+ 0.00      9850.00          9.559         16.620       212.083       1514.9       6.502       194.62       211.24       1.284        214.73
          Sf=0.001007     Headloss Factor=0.100     Total Headloss=0.028 ft.
340+24.00      9850.00          9.645         16.603       212.111       1486.4       6.627       194.63       211.23       1.291        214.73
          Sf=0.000891     Headloss Factor=0.100     Total Headloss=0.070 ft.
340+30.00      9850.00          9.066         16.845       212.181       1611.6       6.112       194.66       211.50       1.173        215.01
          Sf=0.000788     Headloss Factor=0.100     Total Headloss=0.032 ft.
341+ 0.00      9850.00          8.975         16.861       212.212       1575.7       6.251       194.68       211.54       1.113        215.04
          Sf=0.000824     Headloss Factor=0.000     Total Headloss=0.008 ft.
341+30.00      9850.00          8.963         16.842       212.221       1579.2       6.237       194.69       211.53       1.141        215.04
DATA FILE : SUB2CAPX                                                                                                         PAGE 14

  STATION          Q              Dc          DEPTH          HE          AREA         VELOC       INV.EL       W.S.EL       ALPHA        F.B.EL

          Sf=0.000836     Headloss Factor=0.100     Total Headloss=0.030 ft.
341+60.00      9850.00          8.735         16.920       212.251       1607.3       6.128       194.70       211.61       1.091        215.13
          Sf=0.000886     Headloss Factor=0.000     Total Headloss=0.031 ft.
[illegible]    9850.00          8.478         17.004       212.282       1645.2       5.987       194.71       211.72       1.014        215.23
          Sf=0.000748     Headloss Factor=0.100     Total Headloss=0.006 ft.
[illegible]    9850.00          8.404         17.021       212.287       1664.2       5.919       194.72       211.74       1.013        215.25
          Sf=0.000875     Headloss Factor=0.000     Total Headloss=0.021 ft.
[illegible]    9850.00          8.062         17.087       212.308       1755.1       5.612       194.73       211.81       1.010        215.33
          Sf=0.000789     Headloss Factor=0.100     Total Headloss=0.016 ft.
[illegible]    9850.00          7.843         17.128       212.324       1816.1       5.424       194.74       211.86       1.008        215.38
          [illegible]     Headloss Factor=0.300     Total Headloss=0.049 ft.
[illegible]    [illegible]      [illegible]   [illegible]  [illegible]   1971.[illegible]  4.996  194.7[illegible]  211.[illegible]  1.004  215.61
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  342+84.00    9850.00        7.783        19.291      212.389      2135.2      4.613      192.76      212.05      1.022       215.98
        Sf=0.000394    Headloss Factor=0.000    Total Headloss=0.002 ft.
  342+88.00    9850.00        8.297        21.334      212.390      2277.8      4.324      190.76      212.09      1.019       216.42
        Sf=0.000361    Headloss Factor=0.000    Total Headloss=0.011 ft.
  343+18.00    9850.00        8.297        21.303      212.402      2273.1      4.333      190.80      212.10      1.019       216.42
        Sf=0.000363    Headloss Factor=0.000    Total Headloss=0.011 ft.
  343+48.00    9850.00        8.297        21.271      212.413      2268.4      4.342      190.84      212.11      1.019       216.43
        Sf=0.000311    Headloss Factor=0.300    Total Headloss=0.004 ft.
  343+60.00    9850.00        8.297        21.258      212.417      2266.5      4.346      190.86      212.12      1.019       216.43
        Sf=0.000336    Headloss Factor=0.300    Total Headloss=0.042 ft.
  343+70.00    9850.00        8.742        19.505      212.460      1892.2      5.206      192.53      212.03      1.018       216.02
DATA FILE : SUBSCAPX                                                                                                PAGE # 5
   STATION        Q            Dc          DEPTH          HE          AREA       VELOC      INV.EL      W.S.EL      ALPHA       R.B.EL

        Sf=0.000559    Headloss Factor=0.300    Total Headloss=0.070 ft.
  343+80.00    9860.00        9.240        17.694      212.530      1544.5      6.377      194.19      211.89      1.018       215.55
        Sf=0.000997    Headloss Factor=0.300    Total Headloss=0.127 ft.
  343+90.00    9850.00        9.801        15.766      212.657      1219.3      8.078      195.86      211.63      1.018       214.99
        Sf=0.002009    Headloss Factor=0.300    Total Headloss=0.276 ft.
  344+00.00    9350.00       10.432        13.525      212.933       902.9     10.909      197.53      211.05      1.018       214.13
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DATA FILE : A:SUB3CAPX                                                                                  PAGE 1 [illegible] 1

                  SUBCRITICAL WATER SURFACE PROFILE

                         LLAGAS REACH 3A-5

                   CAPACITY-UPSTREAM OF 3A-5 DROP

COMPUTED BY:  D. HALLSTROM    DATE:   7/30/91     CHECKED BY:____________________ DATE:____________

 STATION       Q         Dc        DEPTH       HE        AREA    VELOC     INV EL    W.S.EL    ALPHA    F.B. EL
344+ 9.00   9850.00    11.017    11.000    214.030    616.0   15.990    199.06    210.06    1.000    213.05
      Sf=0.006721    Headloss Factor=0.000    Total Headloss=0.027 ft.
344+13.00   9850.00    11.017    11.409    214.056    648.2   15.196    199.06    210.47    1.000    213.47
      Sf=0.006110    Headloss Factor=0.000    Total Headloss=0.024 ft.
344+17.00   9850.00    11.017    11.563    214.080    660.5   14.913    199.06    210.63    1.000    213.63
      Sf=0.005840    Headloss Factor=0.000    Total Headloss=0.023 ft.
344+21.20   9850.00    11.017    11.679    214.102    669.8   14.705    199.07    210.74    1.000    213.75
      Sf=0.005607    Headloss Factor=0.000    Total Headloss=0.023 ft.
344+25.[illegible]   9850.00    11.017    11.776    214.124    677.7   14.535    199.07    210.84    1.000    213.85
      Sf=0.005471    Headloss Factor=0.000    Total Headloss=0.022 ft.
344+[illegible]   9850.00    11.017    11.860    214.145    684.5   14.389    199.07    210.93    1.000    213.94
      Sf=0.005302    Headloss Factor=0.100    Total Headloss=0.029 ft.
344+[illegible]   9850.00    11.017    11.966    214.173    693.2   14.209    199.07    211.04    1.000    214.06
      Sf=0.005136    Headloss Factor=0.100    Total Headloss=0.027 ft.
344+37.70   9850.00    11.017    12.056    214.199    700.6   14.060    199.07    211.13    1.000    214.15
      Sf=0.004998    Headloss Factor=0.100    Total Headloss=0.026 ft.
344+41.[illegible]   9850.00    11.017    12.134    214.224    707.0   13.931    199.08    211.21    1.000    214.24
      Sf=0.004879    Headloss Factor=0.100    Total Headloss=0.024 ft.
[illegible]   9850.00    11.017    12.205    214.247    712.9   13.817    199.08    211.28    1.000    214.32
      Sf=0.0047[illegible]    Headloss Factor=0.100    Total Headloss=0.022 ft.
[illegible]   [illegible]    11.017    12.2[illegible]    214.[illegible]70    718.2   13.716    199.08    211.35    1.000    214.39
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   STATION          Q             Dc          DEPTH        HE          AREA      VELOC       INV EL      W.S.EL      ALPHA      F.B. EL

         Sf=0.003985    Headloss Factor=0.100    Total Headloss=0.039 ft.
   344+53.20     9850.00       10.954        12.538      214.308       761.2     12.939      199.08      211.62      1.034      214.66
         Sf=0.003826    Headloss Factor=0.100    Total Headloss=0.036 ft.
   344+57.20     9850.00       10.892        12.774      214.343       804.1     12.249      199.08      211.86      1.066      214.91
         Sf=0.003380    Headloss Factor=0.100    Total Headloss=0.030 ft.
   344+61.20     9850.00       10.831        12.966      214.372       842.3     11.694      199.09      212.05      1.093      215.11
         Sf=0.003038    Headloss Factor=0.100    Total Headloss=0.026 ft.
   344+65.20     9850.00       10.770        13.125      214.397       877.1     11.230      199.09      212.21      1.116      215.28
         Sf=0.003176    Headloss Factor=0.100    Total Headloss=0.029 ft.
   344+69.20     9850.00       10.875        13.319      214.425       916.2     10.751      199.09      212.41      1.124      215.48
         Sf=0.003354    Headloss Factor=0.100    Total Headloss=0.024 ft.
   344+73.20     9850.00       10.865        13.449      214.449       948.1     10.389      199.09      212.54      1.138      215.61
         Sf=0.003089    Headloss Factor=0.100    Total Headloss=0.022 ft.
   344+77.20     9850.00       10.814        13.563      214.470       978.4     10.068      199.09      212.66      1.152      215.73
         Sf=0.002865    Headloss Factor=0.100    Total Headloss=0.020 ft.
   344+81.20     9850.00       10.746        13.665      214.489      1007.2      9.779      199.10      212.76      1.164      215.84
         Sf=0.002672    Headloss Factor=0.100    Total Headloss=0.018 ft.
   344+85.20     9850.00       10.667        13.756      214.507      1035.1      9.516      199.10      212.85      1.175      215.94
         Sf=0.002584    Headloss Factor=0.100    Total Headloss=0.005 ft.
   344+87.20     9850.00       10.648        13.758      214.511      1035.2      9.515      199.10      212.86      1.176      215.94
         Sf=0.002538    Headloss Factor=0.100    Total Headloss=0.006 ft.
   344+88.00     9850.00       10.616        13.802      214.517      1050.2      9.379      199.10      212.90      1.182      215.99
         Sf=0.002473    Headloss Factor=0.100    Total Headloss=0.003 ft.
   344+88.50     9850.00       10.595        13.824      214.519      1057.5      9.315      199.10      212.92      1.185      216.01
DATA FILE : A:SUB3CAPX                                                                                               PAGE : 3

   STATION          Q             Dc          DEPTH        HE          AREA      VELOC       INV EL      W.S.EL      ALPHA      F.B. EL

         Sf=0.002442    Headloss Factor=0.100    Total Headloss=0.002 ft.
   [illegible]   9850.00       10.583        13.834      214.521      1061.2      9.282      199.10      212.93      1.186      216.02
         Sf=0.002431    Headloss Factor=0.100    Total Headloss=0.001 ft.
   [illegible]   9850.00       10.581        13.836      214.521      1061.5      9.279      199.10      212.94      1.186      216.02
         [illegible]    Headloss Factor=0.100    Total Headloss=0.008 ft.
         Sf 0.002321    Headloss Factor=0.100    Total Headloss=0.008 ft.
  344+93.20    9850.00       10.488        13.910      214.535     1087.5     9.057     199.10    213.01    1.196     216.10
         Sf=0.002227    Headloss Factor=0.100    Total Headloss=0.015 ft.
  344+97.20    9850.00       10.392        13.980      214.549     1113.1     8.850     199.10    213.08    1.205     216.17
         Sf=0.002109    Headloss Factor=0.100    Total Headloss=0.014 ft.
  345+ 1.20    9850.00       10.292        14.044      214.562     1137.9     8.656     199.11    213.15    1.213     216.24
         Sf=0.002003    Headloss Factor=0.100    Total Headloss=0.013 ft.
  345+ 5.20    9850.00       10.188        14.104      214.574     1162.4     8.474     199.11    213.21    1.222     216.31
         Sf=0.001907    Headloss Factor=0.100    Total Headloss=0.012 ft.
  345+ 9.20    9850.00       10.082        14.160      214.586     1186.4     8.302     199.11    213.27    1.229     216.37
         Sf=0.001819    Headloss Factor=0.100    Total Headloss=0.012 ft.
  345+13.20    9850.00        9.974        14.212      214.597     1210.1     8.140     199.11    213.32    1.237     216.42
         Sf=0.001739    Headloss Factor=0.100    Total Headloss=0.011 ft.
  345+17.20    9850.00        9.863        14.262      214.607     1233.4     7.986     199.11    213.38    1.243     216.47
         Sf=0.001666    Headloss Factor=0.100    Total Headloss=0.011 ft.
  345+21.20    9850.00        9.751        14.309      214.617     1256.5     7.839     199.12    213.42    1.250     216.53
         Sf=0.001598    Headloss Factor=0.100    Total Headloss=0.010 ft.
  345+25.20    9850.00        9.636        14.353      214.627     1279.3     7.699     199.12    213.47    1.256     216.57
DATA FILE : A:SUB3CAPX                                                                                    PAGE 14

   STATION          Q             Dc          DEPTH         HE        AREA      VELOC     INV EL    W.S.EL    ALPHA     F.B. EL

         Sf=0.001536    Headloss Factor=0.100    Total Headloss=0.010 ft.
  345+29.20    9850.00        9.520        14.395      214.636     1301.8     7.567     199.12    213.51    1.261     216.62
         Sf=0.001478    Headloss Factor=0.100    Total Headloss=0.009 ft.
  345+33.20    9850.00        9.401        14.434      214.644     1324.0     7.439     199.12    213.56    1.266     216.66
         Sf=0.001425    Headloss Factor=0.100    Total Headloss=0.009 ft.
  345+37.20    9850.00        9.281        14.471      214.652     1346.1     7.317     199.12    213.60    1.271     216.70
         Sf=0.001375    Headloss Factor=0.100    Total Headloss=0.009 ft.
  345+41.20    9850.00        9.159        14.507      214.660     1368.0     7.200     199.13    213.63    1.275     216.74
         Sf=0.001329    Headloss Factor=0.100    Total Headloss=0.008 ft.
  345+45.20    9850.00        9.035        14.542      214.668     1389.8     7.087     199.13    213.67    1.279     216.78
         [illegible]    Headloss Factor=0.100    Total Headloss=0.008 ft.
  [illegible]  9850.00    [illegible]      14.575      214.675     1411.4     6.979     199.13    213.71    1.283     216.81
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        Sf=0.001021    Headloss Factor=0.100    Total Headloss
 345+59.00    9850.00      8.013      14.957    214.719     1765.8    5.678    199.13    214.09    1.298    217.21
        Sf=0.000865    Headloss Factor=0.100    Total Headloss=0.012 ft.
 345+69.20    9850.00      8.131      14.934    214.731     1725.6    5.708    199.14    214.07    1.300    217.19
        Sf=0.000943    Headloss Factor=0.100    Total Headloss=0.026 ft.
 345+89.20    9850.00      8.379      14.883    214.757     1645.8    5.985    199.15    214.03    1.303    217.15
        Sf=0.001032    Headloss Factor=0.100    Total Headloss=0.014 ft.
 345+99.20    9850.00      8.510      14.854    214.772     1605.7    6.135    199.16    214.01    1.305    217.13
        Sf=0.001135    Headloss Factor=0.100    Total Headloss=0.031 ft.
 346+19.20    9850.00      8.787      14.791    214.803     1525.0    6.459    199.16    213.96    1.308    217.08
        Sf=0.001271    Headloss Factor=0.000    Total Headloss=0.018 ft.
 346+33.00    9850.00      8.991      14.734    214.822     1467.9    6.710    199.17    213.91    1.309    217.04
DATA FILE : A:SUB3CAPX                                                                          PAGE  5
   STATION       Q           Dc        DEPTH       HE       AREA      VELOC    INV.EL    W.S.EL    ALPHA    F.B.EL

        Sf=0.001337    Headloss Factor=0.100    Total Headloss=0.009 ft.
 346+39.20    9850.00      8.997      14.736    214.830     1464.6    6.725    199.18    213.91    1.308    217.04
        Sf=0.001343    Headloss Factor=0.100    Total Headloss=0.028 ft.
 346+59.20    9850.00      9.017      14.743    214.857     1454.0    6.774    199.19    213.93    1.304    217.06
        Sf=0.001352    Headloss Factor=0.100    Total Headloss=0.028 ft.
 346+79.20    9850.00      9.038      14.750    214.885     1443.5    6.824    199.20    213.95    1.300    217.08
        Sf=0.001361    Headloss Factor=0.100    Total Headloss=0.028 ft.
 346+99.20    9850.00      9.058      14.757    214.913     1432.9    6.874    199.21    213.96    1.296    217.10
        Sf=0.001370    Headloss Factor=0.100    Total Headloss=0.028 ft.
 347+19.20    9850.00      9.079      14.765    214.941     1422.4    6.925    199.22    213.98    1.291    217.13
        Sf=0.001380    Headloss Factor=0.100    Total Headloss=0.029 ft.
 347+39.20    9850.00      9.097      14.767    214.970     1411.3    6.979    199.23    214.00    1.286    217.14
        Sf=0.001014    Headloss Factor=0.100    Total Headloss=0.037 ft.
 [illegible]  9850.00      8.828      14.979    215.006     1445.2    6.816    199.24    214.22    1.092    217.37
        Sf=0.000774    Headloss Factor=0.100    Total Headloss=0.002 ft.
 [illegible]  9850.00      8.826      14.980    215.007     1446.1    6.811    199.24    214.22    1.092    217.37
        [illegible]    Headloss Factor=0.100    Total Headloss=0.029 ft.
 [illegible]  [illegible]  [illegible] 14.842    215.036     1432.0    6.879    199.25    214.09    1.291    217.26
        [illegible]    [illegible]              [illegible]=0.010 ft.
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         Sf=0.001330     Headloss Factor=0.100    Total Headloss=0.028 ft.

 [illegible]     9850.00        9.058        14.887      215.073       1446.9     6.808       199.26     214.14      1.294       217.31

         Sf=0.001175     Headloss Factor=0.000    Total Headloss=0.470 ft.

 [illegible]     9850.00        8.800        15.350      215.543       1647.7     5.978       199.46     214.80      1.329       218.02
DATA FILE : A:SUB3CAPX                                                                                                    PAGE : 6

  STATION          Q             Dc          DEPTH        HE            AREA      VELOC        INV EL      W.S.EL      ALPHA       F.B. EL


         Sf=0.001117     Headloss Factor=0.100    Total Headloss=0.158 ft.

 [illegible]     9850.00        9.092        15.326      215.701       1530.2     6.437       199.52     214.85      1.329       218.08

         Sf=0.001180     Headloss Factor=0.100    Total Headloss=0.113 ft.

 354+20.00       9850.00        8.962        15.329      215.813       1462.6     6.734       199.57     214.89      1.305       218.14

         Sf=0.001146     Headloss Factor=0.100    Total Headloss=0.033 ft.

 354+47.00       9850.00        8.999        15.384      215.846       1467.0     6.714       199.58     214.96      1.262       218.22

         Sf=0.001097     Headloss Factor=0.100    Total Headloss=0.019 ft.

 354+60.00       9850.00        8.895        15.435      215.864       1478.1     6.664       199.59     215.02      1.224       218.28

         Sf=0.001014     Headloss Factor=0.100    Total Headloss=0.052 ft.

 355+ 0.00       9850.00        8.521        15.578      215.916       1510.7     6.520       199.61     215.18      1.110       218.45

         Sf=0.000913     Headloss Factor=0.100    Total Headloss=0.024 ft.

 [illegible]     9850.00        8.259        15.646      215.939       1548.5     6.361       199.62     215.26      1.078       218.53

         Sf=0.000820     Headloss Factor=0.100    Total Headloss=0.021 ft.

 355+40.00       9850.00        8.045        15.707      215.960       1589.8     6.196       199.63     215.33      1.054       218.60

         Sf=0.000704     Headloss Factor=0.100    Total Headloss=0.036 ft.

 355+80.00       9850.00        7.651        15.805      215.996       1670.6     5.896       199.65     215.45      1.010       218.72

         Sf=0.000653     Headloss Factor=0.100    Total Headloss=0.025 ft.

 356+10.00       9850.00        7.383        15.866      216.020       1747.1     5.638       199.66     215.53      1.000       218.80

         Sf=0.000651     Headloss Factor=0.300    Total Headloss=0.011 ft.

 [illegible]     9850.00        7.299        15.888      216.031       1775.9     5.547       199.67     215.56      1.000       218.83

         Sf=0.000486     Headloss Factor=0.000    Total Headloss=0.004 ft.

 [illegible]     9850.00        8.245        20.028      216.034       2084.0     4.727       195.66     215.69      1.000       219.76

         Sf=0.000384     Headloss Factor=0.000    Total Headloss=0.012 ft.

 [illegible]     9850.00        8.245        19.994      216.047       2079.2     4.737       195.70     215.70      1.000       219.77
DATA FILE : A:SUB3CAPX                                                                                                    PAGE : 7

  STATION          Q             Dc          DEPTH        HE            AREA      VELOC        INV EL      W.S.EL      ALPHA       F.B. EL
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357+ 0.00    9850.00      8.245      19.951     216.062    2073.0    4.762    195.76    215.71    1.000    219.77

        Sf=0.000361    Headloss Factor=0.300    Total Headloss=0.052 ft.

357+10.00    9850.00      8.668      18.177     216.114    1717.0    5.737    197.43    215.60    1.000    219.34

        Sf=0.000615    Headloss Factor=0.300    Total Headloss=0.088 ft.

357+20.00    9850.00      9.141      16.325     216.203    1385.3    7.110    199.09    215.42    1.000    218.84

        Sf=0.001144    Headloss Factor=0.300    Total Headloss=0.170 ft.

357+30.00    9850.00      9.673      14.301     216.373    1071.4    9.194    200.76    215.06    1.000    218.18

        Sf=0.002556    Headloss Factor=0.300    Total Headloss=0.447 ft.

357+40.00    9850.00     10.273      11.678     216.821     744.8   13.228    202.43    214.10    1.000    216.98
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DATA ONLY CAPACITY

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FILE NAME     A:SUB2CAPX                                              PAGE  1
  STATION           FLOW            BMAIN          BLEFT       BRIGHT        INVMAIN        INVLEFT        INVRIGHT
              NMAIN           NLEFT          NRIGHT         ZLEFT        ZRIGHT        ZCLEFT        ZCRIGHT         FORMLOSS


  317+[illegible].20        9850.0           30.00          16.00        17.00        193.47         209.50         208.30
              0.030           0.060          0.040          2.000        2.000         2.000         2.000           0.00

  317+4[illegible].20       9850.0           30.00          15.47        17.00        193.49         206.07         204.92
              0.030           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  317+[illegible].20        9850.0           33.25          15.20        17.00        193.50         204.35         203.23
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  317+[illegible].20        9850.0           36.50          14.94        17.00        193.51         202.63         201.54
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               9850.0           39.75          14.67        17.00        193.52         200.91         199.85
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               9850.0           43.00          14.41        17.00        193.53         199.20         198.15
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  318+49.[illegible]        9850.0           46.25          14.14        17.00        193.54         197.48         196.46
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  318+60.00                 9850.0           48.00          14.00        17.00        193.55         196.55         195.55
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               9850.0           46.50          14.00        17.00        193.55         196.55         195.55
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               9850.0           43.24          14.00        17.00        193.56         196.56         195.56
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               9850.0           41.61          14.00        17.00        193.57         196.57         195.57
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               9850.0           38.35          14.00        17.23        193.58         196.58         195.58
              0.035           0.060          0.040          2.000        2.000         2.000         2.000           0.10

  [illegible]               [illegible]      [illegible]    14.00        17.47        193.59         196.59         195.5[illegible]
  STATION        FLOW           BMAIN        BLEFT       BRIGHT      INVMAIN      INVLEFT      INVRIGHT
         NMAIN          NLEFT          NRIGHT        ZLEFT       ZRIGHT       ZCLEFT       ZCRIGHT       FORMLOSS


  319+52.00      9850.0         33.00        14.00       17.62       193.60       196.60       195.60
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  319+59.20      9850.0         33.00        14.00       17.70       193.60       196.60       195.60
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  319+72.20      9850.0         33.00        14.00       17.93       193.61       196.61       195.61
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  319+99.20      9850.0         33.00        15.00       18.17       193.62       196.62       195.62
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  320+19.20      9850.0         33.00        14.80       21.00       193.63       196.63       195.63
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  320+39.20      9850.0         33.00        14.60       22.00       193.64       196.64       195.64
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  320+59.20      9850.0         33.00        15.00       23.00       193.65       196.65       195.65
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.10

  320+79.20      9850.0         33.00        16.00       24.00       193.66       196.66       195.66
         0.030          0.030          0.030         2.000       2.000        2.000        2.000         0.10

  320+99.20      9850.0         33.00        16.00       24.00       193.67       196.67       195.67
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.00

  321+15.00      9850.0         33.00        16.00       24.00       193.68       196.68       195.68
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.00

  324+99.20      9850.0         33.00        10.00       24.00       193.87       196.87       195.87
         0.035          0.060          0.040         2.000       2.000        2.000        2.000         0.00

  327+19.00      9850.0         33.00        10.00       22.00       193.99       196.99       195.99
         0.035          0.035          0.040         2.000       2.000        2.000        2.000         0.00

  [illegible]    9850.0         33.00        10.00       21.00       194.07       197.07       196.07
         0.035          0.035          0.040         2.000       2.000        2.000        2.000         0.00
FILE NAME :    A:SUB2CAPX                                          PAGE  3
  STATION        FLOW           BMAIN        BLEFT       BRIGHT      INVMAIN      INVLEFT      INVRIGHT
         NMAIN          NLEFT          NRIGHT        ZLEFT       ZRIGHT       ZCLEFT       ZCRIGHT       FORMLOSS
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               0.035         0.035              0.040          2.000          2.000          2.000          2.000          0.00

[illegible]        9850.0                33.00          10.00          21.00         194.30         197.30         196.30
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.00

334+00.00          9850.0                33.00          10.00          21.00         194.36         197.36         196.36
               0.035         0.060              0.035          2.000          2.000          2.000          2.000          0.00

[illegible]        9850.0                33.00          10.00          21.00         194.47         197.47         196.47
               0.035         0.060              0.035          2.000          2.000          2.000          2.000          0.00

340+ 0.00          9850.0                33.00          10.00          19.00         194.62         197.62         196.62
               0.035         0.060              0.035          2.000          2.000          2.000          2.000          0.00

340+24.00          9850.0                33.00          10.00          17.00         194.63         197.63         196.46
               0.035         0.060              0.035          2.000          2.000          2.000          2.000          0.10

340+80.00          9850.0                37.38          10.00          21.00         194.66         202.41         196.09
               0.035         0.060              0.035          2.000          2.000          2.000          2.000          0.10

341+00.00          9850.0                40.50          10.00          17.00         194.68         205.82         195.83
               0.035         0.060              0.035          2.000          2.000          2.000          2.000          0.10

341+30.00          9850.0                41.28          10.00          17.00         194.69         206.67         195.76
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.00

341+60.00          9850.0                43.63          10.00          17.00         194.70         209.24         195.56
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.10

341+90.00          9850.0                46.36          10.00          17.00         194.71         212.22         195.33
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.00

342+ 0.00          9850.0                46.75          10.00          17.59         194.72         212.65         195.30
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.10

342+24.00          9850.0                48.63          10.00          20.41         194.73         214.70         195.14
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.00
FILE NAME =    A:SUB2CAPX                                                 PAGE 74
   STATION          FLOW             BMAIN          BLEFT         BRIGHT        INVMAIN        INVLEFT        INVRIGHT
               NMAIN         NLEFT              NRIGHT         ZLEFT          ZRIGHT         ZCLEFT         ZCRIGHT        FORMLOSS


342+40.00          9850.0                49.88          10.00          22.29         194.74         214.70         195.04
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.10

[illegible]        9850.0                53.00          10.00          27.00         194.76         214.70         194.76
               0.035         0.060              0.040          2.000          2.000          2.000          2.000          0.30
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              0.035        0.060         0.035       2.000       2.000       2.000       2.000          0.30

342+88.00        9850.0             64.00           10.00        0.10       190.76       214.70       190.76
              0.035        0.060         0.035       2.000       2.000       2.000       2.000          0.00

343+18.00        9850.0             64.00           10.00        0.10       190.80       214.70       190.80
              0.035        0.060         0.035       2.000       2.000       2.000       2.000          0.00

343+46.00        9850.0             64.00           10.00        0.10       190.84       214.70       190.84
              0.035        0.060         0.035       2.000       2.000       2.000       2.000          0.00

343+60.00        9850.0             64.00           10.00        0.10       190.86       214.70       190.86
              0.030        0.060         0.030       2.000       2.000       2.000       2.000          0.30

343+70.00        9850.0             57.90           10.00        0.10       192.53       214.70       192.53
              0.030        0.060         0.030       2.000       2.000       2.000       2.000          0.30

343+80.00        9850.0             51.80           10.00        0.10       194.19       214.70       194.19
              0.030        0.060         0.030       2.000       2.000       2.000       2.000          0.30

343+90.00        9850.0             45.71           10.00        0.10       195.86       214.70       195.86
              0.030        0.060         0.030       2.000       2.000       2.000       2.000          0.30

344+ 0.00        9850.0             39.61           10.00        0.10       197.53       214.70       197.53
              0.030        0.060         0.030       2.000       2.000       2.000       2.000          0.30

344+ 9.[illegible]0        9850.0             34.00           10.00        0.10       199.06       214.70       199.06
              0.030        0.060         0.030       2.000       2.000       2.000       2.000          0.30
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FILE NAME =  A:SUB3CAPX                                          PAGE 1
  STATION        FLOW          BMAIN        BLEFT     BRIGHT    INVMAIN    INVLEFT   INVRIGHT
          NMAIN          NLEFT        NRIGHT     ZLEFT     ZRIGHT     ZCLEFT    ZCRIGHT      FORMLOSS


 344+ 9.20      9850.0         34.00        10.00      17.00     199.06     214.70     215.30
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.00

 344+13.20      9850.0         34.00        10.00      17.00     199.06     214.36     214.92
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.00

 344+17.20      9850.0         34.00        10.00      17.00     199.06     214.03     214.54
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.00

 344+21.20      9850.0         34.00        10.00      17.00     199.07     213.69     214.17
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.00

 344+25.20      9850.0         34.00        10.00      17.00     199.07     213.36     213.79
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.00

 344+29.20      9850.0         34.00        10.00      17.00     199.07     213.02     213.41
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.00

 344+33.20      9850.0         34.00        10.00      17.00     199.07     212.69     213.03
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.10

 344+37.20      9850.0         34.00        10.00      17.00     199.07     212.35     212.65
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.10

 344+41.20      9850.0         34.00        10.00      17.00     199.08     212.02     212.28
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.10

 344+45.20      9850.0         34.00        10.00      17.00     199.08     211.68     211.90
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.10

 344+49.20      9850.0         34.00        10.00      17.00     199.08     211.35     211.52
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.10

 344+53.20      9850.0         34.51        10.00      17.00     199.08     211.01     211.14
          0.030          0.060        0.040      2.000     2.000      2.000      2.000        0.10

 [illegible]    [illegible]    35.0[illegible]  10.00  17.00     199.08     210.68     210.76
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FILE NAME =   A:SUBSCAPX
   STATION          FLOW               BMAIN          BLEFT         BRIGHT         INVMAIN         INVLEFT         INVRIGHT
              NMAIN           NLEFT          NRIGHT         ZLEFT          ZRIGHT          ZCLEFT          ZCRIGHT          FORMLOSS

  344+61.20          9850.0            35.53          10.00          17.00          199.09          210.34          210.39
              0.030           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+65.20          9850.0            36.04          10.00          17.00          199.09          210.01          210.01
              0.030           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+69.20          9850.0            36.55          10.00          17.00          199.09          209.67          209.63
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+73.20          9850.0            37.06          10.00          17.00          199.09          209.34          209.25
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+77.20          9850.0            37.57          10.00          17.00          199.09          209.00          208.87
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+81.20          9850.0            38.08          10.00          17.00          199.10          208.67          208.50
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+85.20          9850.0            38.59          10.00          17.00          199.10          208.33          208.12
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+87.70          9850.0            38.85          10.00          17.00          199.10          208.15          208.44
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+88.00          9850.0            38.95          10.00          17.00          199.10          208.07          208.00
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+88.50          9850.0            39.01          10.00          17.00          199.10          208.03          207.80
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+88.80          9850.0            39.05          10.00          17.00          199.10          208.01          207.70
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+89.20          9850.0            39.10          10.00          17.00          199.10          208.00          207.74
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10

  344+91.00          9850.0            39.33          10.00          17.00          199.10          207.80          207.49
              0.035           0.060          0.040          2.000          2.000           2.000           2.000            0.10
FILE NAME =   A:SUBSCAPX                                             PAGE  3
   STATION          FLOW               BMAIN          BLEFT         BRIGHT         INVMAIN         INVLEFT         INVRIGHT
              NMAIN           NLEFT          NRIGHT         ZLEFT          ZRIGHT          ZCLEFT          ZCRIGHT          FORMLOSS
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[illegible]         9850.0
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 344+57.20          9850.0            40.12             10.00          17.00          199.10        207.33         206.98
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+ 1.20          9850.0            40.63             10.00          17.00          199.11        206.99         206.61
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+ 5.20          9850.0            41.14             10.00          17.00          199.11        206.66         206.23
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+ 9.20          9850.0            41.65             10.00          17.00          199.11        206.32         205.85
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+13.20          9850.0            42.16             10.00          17.00          199.11        205.98         205.47
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+17.20          9850.0            42.67             10.00          17.00          199.11        205.65         205.09
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+21.20          9850.0            43.18             10.00          17.00          199.12        205.31         204.72
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+25.20          9850.0            43.69             10.00          17.00          199.12        204.98         204.34
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+29.20          9850.0            44.20             10.00          17.00          199.12        204.64         203.96
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+33.20          9850.0            44.71             10.00          17.00          199.12        204.31         203.58
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+37.20          9850.0            45.22             10.00          17.00          199.12        203.97         203.20
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

 345+41.20          9850.0            45.73             10.00          17.00          199.13        203.64         202.83
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10
FILE NAME =  A:SUB3CAPX                                                              PAGE  4

   STATION          FLOW              BMAIN             BLEFT          BRIGHT         INVMAIN       INVLEFT        INVRIGHT
            NMAIN            NLEFT                 NRIGHT            ZLEFT          ZRIGHT         ZCLEFT         ZCRIGHT        FORMLOSS


 345+45.20          9850.0            46.24             10.00          17.00          199.13        203.80         202.45
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10

[illegible]         9850.0            46.75             10.00          17.00          199.13        202.97         202.07
            0.035            0.060                 0.040             2.000          2.000          2.000          2.000          0.10
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             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 345+69.20       9850.0          45.93         20.38         27.11         199.14        202.15        201.15
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 345+89.20       9850.0          41.88         19.16         27.34         199.15        202.16        201.16
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 345+99.20       9850.0          39.85         18.55         27.45         199.16        202.16        201.16
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 346+19.20       9850.0          35.80         17.33         27.67         199.16        202.17        201.17
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 346+33.00       9850.0          33.00         16.48         27.82         199.17        202.18        201.18
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.00

 346+39.20       9850.0          33.00         16.10         27.89         199.18        202.18        201.18
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 346+59.20       9850.0          33.00         14.88         28.11         199.19        202.19        201.19
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 346+79.20       9850.0          33.00         13.66         28.33         199.20        202.20        201.20
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 346+99.20       9850.0          33.00         12.44         28.56         199.21        202.21        201.21
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 347+19.20       9850.0          33.00         11.22         28.78         199.22        202.22        201.22
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10
FILE NAME =  A:SUB3CAPX                                             PAGE  8
   STATION           FLOW            BMAIN         BLEFT         BRIGHT        INVMAIN       INVLEFT       INVRIGHT
             NMAIN        NLEFT         NRIGHT        ZLEFT         ZRIGHT        ZCLEFT        ZCRIGHT       FORMLOSS



 347+39.20       9850.0          33.00         10.00         29.00         199.23        202.23        201.23
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10

 347+57.00       9850.0          33.00         10.50         29.00         199.24        202.24        201.24
             0.030        0.030         0.030         2.000         2.000         2.000         2.000         0.10

 347+[illegible].20       9850.0          33.00         10.61         28.96         199.24        202.24        201.24
             0.030        0.030         0.030         2.000         2.000         2.000         2.000         0.10

 [illegible]       9850.0          33.00         11.00         28.92         199.25        202.25        201.25
             0.035        0.060         0.040         2.000         2.000         2.000         2.000         0.10
   347+79.20         9850.0            33.00            11.22           28.91            199.28          202.25          201.26
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   347+99.20         9850.0            33.00            11.83           28.87            199.26          202.26          201.26
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   351+97.20         9850.0            33.00            24.00           28.00            199.46          202.46          201.46
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.00

   353+30.00         9850.0            33.00            18.00           25.00            199.62          202.53          201.53
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   354+20.00         9850.0            47.59            11.79           18.79            199.57          202.57          208.62
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   354+46.00         9850.0            51.80            10.00           17.00            199.58          202.58          210.67
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   354+60.00         9850.0            54.07            10.00           17.00            199.59          203.83          211.77
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   355+ 0.00         9850.0            60.55            10.00           17.00            199.61          207.40          214.93
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   355+20.00         9850.0            63.79            10.00           17.00            199.62          209.19          216.60
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10
FILE NAME =   A:SUBSCAPX                                                               PAGE  6

    STATION            FLOW             BMAIN             BLEFT          BRIGHT          INVMAIN         INVLEFT         INVRIGHT
                NMAIN           NLEFT            NRIGHT          ZLEFT           ZRIGHT          ZCLEFT          ZCRIGHT            FORMLOSS



   355+40.00         9850.0            67.03            10.00           17.00            199.63          210.97          216.50
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   355+60.00         9850.0            73.52            10.00           17.00            199.65          214.55          216.51
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   35[illegible]+10.00   9850.0            78.38            10.00           17.00            199.66          217.50          216.51
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.10

   [illegible]       9850.0            80.00            10.00           17.00            199.67          217.50          216.51
                0.035           0.060            0.040           2.000           2.000           2.000           2.000              0.30

   [illegible]       [illegible]       64.00            10.00           17.00            195.66          217.50          216.51
                                                                 [illegible]     [illegible]     2.000           2.000              0.00
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               0.030         0.060               0.040        2.000       2.000       2.000       2.000        0.30

  357+10.00         9850.0             58.11           10.00         17.00       197.43      217.51      216.52
               0.030         0.060               0.040        2.000       2.000       2.000       2.000        0.30

  357+20.00         9850.0             52.21           10.00         17.00       199.09      217.51      216.52
               0.030         0.060               0.040        2.000       2.000       2.000       2.000        0.30

  357+30.00         9850.0             46.32           10.00         17.00       200.76      217.51      216.52
               0.030         0.060               0.040        2.000       2.000       2.000       2.000        0.30

  357+40.00         9850.0             40.42           10.00         17.00       202.43      217.51      216.52
               0.030         0.060               0.040        2.000       2.000       2.000       2.000        0.30

  357+49.20         9850.0             35.00           10.00         17.00       203.96      217.51      216.52
               0.030         0.060               0.040        2.000       2.000       2.000       2.000        0.30
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WATER SURFACE PROFILE FOR 8100 cfs

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DATA FILE : A:SUBESTA

         SUBCRITICAL WATER SURFACE PROFILE

             LLAGAS CREEK REACH 3A-5

                  STABILITY     8100 cfs

  COMPUTED BY:  D. HALLSTROM   DATE:   7/27/91   CHECKED BY:_________________________     DATE:__________

    STATION        Q          Dc          DEPTH      HE            AREA      VELOC      INV EL    W.S.EL     ALPHA     [illegible]
VMAIN   VLEFT    VRIGHT    QMAIN      QLEFT      QRIGHT

   317+ 9.20    8100.00     10.370      10.370    207.620        526.2     15.394     193.47    203.84     1.000     [illegible]
 0.00   0.00   0.00        0.00       0.00       0.00

      Sf=0.004976    Headloss Factor=0.100    Total Headloss=0.315 ft.

   317+49.20    8100.00     10.370      11.820    207.834        640.7     12.643     193.49    205.31     [illegible]     [illegible]
15.03  -0.00   2.21     9628.26       0.00      15.03

      Sf=0.003075    Headloss Factor=0.100    Total Headloss=0.169 ft.

   317+69.20    8100.00     10.218      13.068    208.002        866.5      9.359     193.50    [illegible]    [illegible]     [illegible]
10.62   5.08   6.50     8062.57     195.44     440.36

      Sf=0.002059    Headloss Factor=0.100    Total Headloss=0.084 ft.

   317+89.20    8100.00      9.991      13.558    208.086       1022.8      7.919     193.51    207.07     [illegible]     [illegible]
 9.44   6.17   7.07     7670.04     530.48     881.28

      Sf=0.001351    Headloss Factor=0.100    Total Headloss=0.050 ft.

   318+ 9.20    8100.00      9.299      13.830    208.136       1154.3      7.017     193.52    207.35     [illegible]     [illegible]
 8.11   6.11   6.76     6769.23     830.25    1243.54

      Sf=0.000966    Headloss Factor=0.100    Total Headloss=0.034 ft.

   318+29.20    8100.00      8.510      14.002    208.169       1273.8      6.359     193.53    [illegible]    1.074     [illegible]
 7.18   5.92   6.45     6004.08    1123.09    1594.59

      Sf=0.000725    Headloss Factor=0.100    Total Headloss=0.025 ft.

   318+49.20    8100.00      7.709      14.120    208.193       1386.1      5.844     193.54    [illegible]    [illegible]     [illegible]
 6.44   5.69   6.14     5295.59    1410.59    1938.20

      Sf=0.000595    Headloss Factor=0.100    Total Headloss=0.011 ft.

   318+60.00    8100.00      7.296      14.164    208.204       1444.2      5.609     193.55    [illegible]    [illegible]     [illegible]
 5.92   5.41   5.81     4786.01    1520.42    2062.21

      Sf=0.000567    Headloss Factor=0.100    Total Headloss=0.007 ft.
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        Sf=[illegible]    Headloss Factor=0.100    Total Headloss=[illegible] ft.

   318+89.20   [illegible]     7.559        14.119     208.228        1370.9     [illegible]     193.56     [illegible]  [illegible]  [illegible]
 5.92   5.42   [illegible]   4571.83   1514.60   2056.84

        Sf=0.000637    Headloss Factor=0.100    Total Headloss=0.008 ft.

   318+99.20    8100.00     7.655        14.103     208.237        1346.8     6.019     193.57     [illegible]  [illegible]  [illegible]
 6.09   5.58   6.00    4350.86   1556.62   2112.12
DATA FILE : A:SUB2STAX                                                                      PAGE : [illegible]

    STATION        Q            Dc          DEPTH        HE            AREA       VELOC      INV EL     [illegible]   ALPHA    [illegible]
VMAIN      VLEFT       VRIGHT      QMAIN     QLEFT      QRIGHT

        Sf=0.000675    Headloss Factor=0.100    Total Headloss=0.018 ft.

   319+19.20    8100.00     7.844        14.069     208.255        1298.3     6.239     193.58     [illegible]  [illegible]  [illegible]
 6.25   5.74   6.13    4167.03   1592.10   2184.20

        Sf=0.000731    Headloss Factor=0.100    Total Headloss=0.019 ft.

   319+39.20    8100.00     8.045        14.031     208.274        1250.7     6.477     193.59     [illegible]  [illegible]  [illegible]
 6.47   5.96   6.43    4010.36   1645.26   2280.65

        Sf=0.000782    Headloss Factor=0.100    Total Headloss=0.013 ft.

   319+52.00    8100.00     8.179        14.005     208.288        1220.0     6.639     193.60     [illegible]  1.003        [illegible]
 6.68   6.16   6.65    3933.65   1693.83   2363.64

        Sf=0.000802    Headloss Factor=0.100    Total Headloss=0.006 ft.

   319+59.20    8100.00     8.175        14.008     208.293        1221.4     6.632     193.60     [illegible]  [illegible]  [illegible]
 6.76   6.24   6.74    3985.80   1716.59   2403.57

        Sf=0.000797    Headloss Factor=0.100    Total Headloss=0.016 ft.

   319+79.20    8100.00     8.164        14.019     208.309        1225.5     6.610     193.61     [illegible]  1.003        [illegible]
 6.75   6.22   6.73    3979.22   1714.78   2423.64

        Sf=0.000780    Headloss Factor=0.100    Total Headloss=0.017 ft.

   319+99.20    8100.00     8.118        14.045     208.326        1242.5     6.519     193.62     [illegible]  [illegible]  [illegible]
 6.68   6.22   6.68    3949.32   1788.72   2430.81

        Sf=0.000738    Headloss Factor=0.100    Total Headloss=0.019 ft.

   320+19.20    8100.00     8.000        14.091     208.344        1280.1     6.327     193.63     [illegible]  1.003        [illegible]
 6.51   6.05   6.64    3862.55   1737.39   2655.05

        Sf=0.000702    Headloss Factor=0.100    Total Headloss=0.015 ft.

   320+39.20    8100.00     7.964        14.106     208.359        1292.0     6.269     193.64     207.75       1.004        [illegible]
 6.36   5.90   6.52    3774.47   1683.12   2690.79

        Sf=0.000681    Headloss Factor=0.100    Total Headloss=0.015 ft.

   320+59.20    8100.00     7.909        14.129     208.373        1311.4     6.177     193.65     [illegible]  1.004        [illegible]
 6.27   5.83   6.46    3726.99   1695.95   2752.92

        Sf=0.000607    Headloss Factor=0.100    Total Headloss=0.013 ft.

   [illegible]
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  320+99.2[illegible]  [illegible].00      7.837       14.157     208.397        1338.[illegible]              19[illegible].67    [illegible]       [illegible]
 5.85   5.49   [illegible]  3486.96    1664.07     2666.18

          Sf=0.000636    Headloss Factor=0.000    Total Headloss=0.010 ft.

  321+15.00    8100.00      7.837       14.159     208.407        1338.5      6.052      193.68     [illegible]       [illegible]       [illegible]
 6.06   5.69   6.28   3613.44    1724.61     2763.07
DATA FILE : A:SUB2STAX                                                                                          [illegible]

    STATION         Q           Dc          DEPTH       HE            AREA        VELOC       INV EL      W.S.EL      ALPHA       [illegible]
VMAIN      VLEFT       VRIGHT      QMAIN       QLEFT       QRIGHT


          Sf=0.000673    Headloss Factor=0.000    Total Headloss=0.259 ft.

  324+99.20    8100.00      8.030       14.160     208.665        1271.7      6.369      193.87     [illegible]       [illegible]       [illegible]
 6.24   5.51   6.47   3718.88    1301.35     2843.85

          Sf=0.000767    Headloss Factor=0.000    Total Headloss=0.192 ft.

  327+49.00    8100.00      8.198       14.162     208.856        1247.7      6.492      193.99     [illegible]       [illegible]       [illegible]
 6.67   4.20   6.83   3972.11     992.95     2837.26

          Sf=0.000833    Headloss Factor=0.000    Total Headloss=0.125 ft.

  328+99.20    8100.00      8.246       14.204     208.981        1240.5      6.530      194.07     [illegible]       [illegible]       [illegible]
 6.96   4.39   7.08   4158.83    1042.45     2870.40

          Sf=0.000821    Headloss Factor=0.000    Total Headloss=0.329 ft.

  332+99.20    8100.00      8.246       14.361     209.309        1258.4      6.437      194.27     [illegible]       [illegible]       [illegible]
 6.96   4.39   7.08   4203.53    1063.74     2916.63

          Sf=0.000757    Headloss Factor=0.000    Total Headloss=0.048 ft.

  333+63.00    8100.00      8.166       14.416     209.357        1266.2      6.397      194.30     [illegible]       [illegible]       [illegible]
 6.70   5.92   6.82   4066.87    1446.72     2828.22

          Sf=0.000788    Headloss Factor=0.000    Total Headloss=0.092 ft.

  334+80.00    8100.00      8.259       14.419     209.448        1266.6      6.395      194.36     [illegible]       [illegible]       [illegible]
 6.84   6.04   4.97   4150.74    1476.89     2062.08

          Sf=0.000864    Headloss Factor=0.000    Total Headloss=0.189 ft.

  336+99.20    8100.00      8.259       14.509     209.637        1277.6      6.340      194.47     [illegible]       [illegible]       [illegible]
 7.19   6.35   5.22   4391.17    1571.45     2188.52

          Sf=0.000859    Headloss Factor=0.000    Total Headloss=0.258 ft.

  340+ 0.00    8100.00      8.355       14.600     209.895        1263.5      6.411      194.62     [illegible]       [illegible]       [illegible]
 7.20   6.36   5.16   4425.51    1592.84     2053.62

          Sf=0.000881    Headloss Factor=0.100    Total Headloss=0.024 ft.

  340+24.00    8100.00      8.416       14.590     209.919        1239.9      6.533      194.65     [illegible]       [illegible]       [illegible]
 7.29   6.43   5.18   4450.47    1609.27     1966.30

          Sf=0.000860    Headloss Factor=0.100    Total Headloss=0.058 ft.

  340+80.00    8100.00      8.177       14.717     209.977        1331.7      6.082      194.66     [illegible]       [illegible]       [illegible]
 [illegible]   [illegible].84   5.38   5[illegible]6.11    [illegible]71.09     2449.37
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  341+20.00    8100.00      8.013       14.701     210.016         12[illegible]          [illegible]     [illegible]      [illegible]       [illegible]
 6.65  3.3           5525.00    162.98    2200.65

          Sf=0.0           Headloss Factor=0.000    Total Headloss=0.008 ft.

  341+30.00    8100.00      7.958       14.710     210.023         1299.1      6.235      194.69     [illegible]      [illegible]       [illegible]
 6.38  2.84   7.26   5402.65      98.83    3032.98
DATA FILE : A:SUB2STAX                                                                                           [illegible]

   STATION        Q            Dc          DEPTH        HE                AREA       VELOC      INV EL     [illegible]      ALPHA       [illegible]
VMAIN    VLEFT      VRIGHT      QMAIN      QLEFT      QRIGHT

          Sf=0.000735      Headloss Factor=0.100    Total Headloss=0.024 ft.

  341+60.00    8100.00      7.765       14.749     210.047         1316.6      6.152      194.70     209.44      1.026       [illegible]
 5.81  0.56   6.93   5149.53       1.17    2972.69

          Sf=0.000759      Headloss Factor=0.000    Total Headloss=0.027 ft.

  341+95.00    8100.00      7.553       14.771     210.073         1361.7      5.948      194.71     209.48      1.072       [illegible]
 5.22  0.56   7.12   4808.81       1.19    3138.16

          Sf=0.000776      Headloss Factor=0.100    Total Headloss=0.005 ft.

  342+ 0.00    8100.00      7.494       14.786     210.078         1378.3      5.877      194.72     209.50      1.075       [illegible]
 5.28  0.57   7.24   4898.01       1.21    3269.22

          Sf=0.000706      Headloss Factor=0.000    Total Headloss=0.017 ft.

  342+24.00    8100.00      7.220       14.845     210.094         1457.2      5.559      194.73     [illegible]      1.087       [illegible]
 5.07  0.54   7.10   4837.40       1.15    3572.42

          Sf=0.000623      Headloss Factor=0.100    Total Headloss=0.013 ft.

  342+40.00    8100.00      7.046       14.883     210.107         1510.4      5.363      194.74     209.62      1.095       [illegible]
 4.78  0.51   6.79   4647.84       1.08    3651.58

          Sf=0.000525      Headloss Factor=0.300    Total Headloss=0.042 ft.

  342+80.00    8100.00      6.634       14.975     210.149         1646.3      4.920      194.76     209.73      1.114       [illegible]
 4.42  0.47   6.49   4503.97       0.99    4074.95

          Sf=0.000461      Headloss Factor=0.300    Total Headloss=0.033 ft.

  342+84.00    8100.00      6.889       17.106     210.182         1818.6      4.454      192.76     209.87      1.024       [illegible]
 4.67  0.44   3.55   7119.56       0.93    1043.80

          Sf=0.000406      Headloss Factor=0.000    Total Headloss=0.002 ft.

  342+88.00    8100.00      7.355       19.152     210.183         1961.3      4.130      190.76     209.91      1.021       [illegible]
 4.53  0.41   3.59   7218.60       0.87    1322.49

          Sf=0.000366      Headloss Factor=0.000    Total Headloss=0.011 ft.

  343+18.00    8100.00      7.355       19.121     210.194         1956.9      4.139      190.80     [illegible]      1.021       [illegible]
 4.30  0.39   3.40   6837.09       0.83    1250.58

          Sf=0.000368      Headloss Factor=0.000    Total Headloss=0.011 ft.

  343+48.00    8100.00      7.355       19.089     210.206         1952.5      4.149      190.84     [illegible]      1.021       [illegible]
 4.31  0.39   3.41   6833.80       0.83    1248.88
 4.57   0.38   [illegible]   [illegible]        0.31     10[illegible].47
DATA FILE :           AX

    STATION        Q                 Dc          DEPTH         HE             AREA         V             INV EL      [illegible]    [illegible]
VMAIN     VLEFT         VRIGHT       QMAIN       QLEFT      QRIGHT


         Sf=0.000602     Headloss Factor=0.300      Total Headloss=0.074 ft.

   343+80.00     8100.00          8.220         15.504      210.327          1285.5       6.301          194.19      [illegible]    1.02[illegible]
 5.59    0.50    4.43     5838.79         1.06      1071.60

         Sf=0.001141     Headloss Factor=0.300      Total Headloss=0.143 ft.

   343+90.00     8100.00          8.739         13.643      210.470           987.2       8.205          195.86      209.40       1.021
 7.05    0.69    5.57     5657.63         1.46      1029.73

         Sf=0.002560     Headloss Factor=0.300      Total Headloss=0.365 ft.

   344+ 0.00     8100.00          9.329         11.110      210.836           688.1      11.772          197.53      208.64       1.022
 9.36    1.04    7.32     5269.46         2.19       911.92
```

Q = 8100 CFS
K = 0.3 (FORMLOSS)
n = 0.03 GROUTED ROCK

```
 'WASP2' SUPERCRITICAL WATER SURFACE PROFILE

                    LLAGAS CREEK REACH 3A-5
                   DROP #2

COMPUTED BY:  D. HALLSTROM    DATE:  07-26-1990    DATA FILE: SUP2STAX     CHECKED BY:_________________     DATE:__________


STATION      Q        B       Z        Dc      DEPTH     AREA      VELOC     E.G.L      INV EL     W.S.EL  SCS FREE  FROUDE  SEQUENT
  ft        cfs      ft                ft       ft      sq ft      fps       ft          ft         ft      BOARD    NUMBER   DEPTH

344+09.20  8100.00  34.00    2.00     9.879    9.879    531.1     15.25     212.55     199.06     208.94   12.35     1.00     9.88

          n=0.0300       So=0.166667     Sf=0.011151     Headloss Factor=0.300    Total Headloss=1.057 ft. Se=0.114571

344+00.00  8100.00  39.61    2.00     9.264    7.178    387.3     20.92     211.50     197.53     204.70    8.97     1.55    11.66

          n=0.0300       So=0.166670     Sf=0.023313     Headloss Factor=0.300    Total Headloss=0.862 ft. Se=0.085835

343+90.00  8100.00  45.71    2.00     8.677    5.890    338.6     23.93     210.64     195.86     201.75    7.36     1.91    12.12

          n=0.0300       So=0.166670     Sf=0.034717     Headloss Factor=0.300    Total Headloss=0.853 ft. Se=0.085047

343+80.00  8100.00  51.80    2.00     8.164    5.020    310.4     26.10     209.79     194.19     199.21    6.27     2.21    12.26

          n=0.0300     . So=0.166660     Sf=0.046897     Headloss Factor=0.300    Total Headloss=0.890 ft. Se=0.088881

343+70.00  8100.00  57.90    2.00     7.712    4.373    291.4     27.80     208.90     192.53     196.90    5.47     2.49    12.27

          n=0.0300       So=0.166670     Sf=0.060053     Headloss Factor=0.300    Total Headloss=0.964 ft. Se=0.095712

343+60.00  8100.00  64.00    2.00     7.312    3.872    277.7     29.17     207.94     190.86     194.73    4.87     2.75    12.20
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GROUTED ROCK

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DATA FILE : A:SUB3STAX

              SUBCRITICAL WATER SURFACE PROFILE

              UPSTREAM OF 3A-5 DROP
                      STABILITY-8100CFS

  COMPUTED BY:      DATE:         CHECKED BY:_______________________     DATE:________________

    STATION        Q              Dc          DEPTH         HE             AREA       VELOC        INV EL     W.S.EL     ALPHA      [illegible]
VMAIN    VLEFT        VRIGHT        QMAIN       QLEFT         QRIGHT
    (CREST)
   344+ 9.20     8100.00          9.880        9.880       212.551         531.1      15.250       199.06     208.94     1.000      [illegible]
 0.00    0.00    0.00          0.00         0.00         0.00

          Sf=0.006849     Headloss Factor=0.000     Total Headloss=0.027 ft.

   344+13.20     8100.00          9.880       10.258       212.578         559.2      14.484       199.06     209.32     1.000      [illegible]
15.00    0.00    0.00     8389.84           0.00         0.00

          Sf=0.006210     Headloss Factor=0.000     Total Headloss=0.025 ft.

   344+17.20     8100.00          9.880       10.407       212.602         570.4      14.200       199.06     209.47     1.000      [illegible]
14.40    0.00    0.00     8211.38           0.00         0.00

          Sf=0.005920     Headloss Factor=0.000     Total Headloss=0.024 ft.

   344+21.20     8100.00          9.880       10.518       212.624         578.9      13.993       199.07     209.58     1.000      [illegible]
14.14    0.00    0.00     8182.71           0.00         0.00

          Sf=0.005703     Headloss Factor=0.000     Total Headloss=0.023 ft.

   344+25.20     8100.00          9.880       10.611       212.646         586.0      13.823       199.07     209.68     1.000      [illegible]
13.94    0.00    0.00     8168.53           0.00         0.00

          Sf=0.005525     Headloss Factor=0.000     Total Headloss=0.022 ft.

   344+29.20     8100.00          9.880       10.693       212.668         592.2      13.677       199.07     209.76     1.000      [illegible]
13.78    0.00    0.00     8159.55           0.00         0.00

          Sf=0.005348     Headloss Factor=0.100     Total Headloss=0.029 ft.

   344+33.20     8100.00          9.880       10.793       212.696         599.9      13.502       199.07     209.86     1.000      [illegible]
13.62    0.00    0.00     8172.26           0.00         0.00

          Sf=0.005175     Headloss Factor=0.100     Total Headloss=0.027 ft.

   344+37.20     8100.00          9.880       10.878       212.721         606.5      13.356       199.07     209.95     1.000      [illegible]
13.46    0.00    0.00     8160.97           0.00         0.00

          Sf=0.005031     Headloss Factor=0.100     Total Headloss=0.025 ft.
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        Sf=[illegible]    Headloss Factor=0.100    Total Headloss=[illegible] ft.

   344+45.2[illegible]  [illegible]      9.880      11.020     212.769        617.[illegible]   [illegible]     199.08    [illegible]   1.000     [illegible]
13.19   0.00   [illegible]   8148.13       0.00        0.00

        Sf=0.004796    Headloss Factor=0.100    Total Headloss=0.023 ft.

   344+49.20    8100.00      9.880      11.082     212.792        622.4     13.013     199.08    [illegible]   1.000     [illegible]
13.08   0.00   0.00   8143.79       0.00        0.00
DATA FILE : A:SUB3STAX                                                                           PAGE :

    STATION         Q           Dc          DEPTH        HE           AREA      VELOC       INV EL     W.S.EL     ALPHA      [illegible]
VMAIN    VLEFT     VRIGHT     QMAIN       QLEFT      QRIGHT

        Sf=0.004519    Headloss Factor=0.100    Total Headloss=0.036 ft.

   344+63.20    8100.00      9.821      11.298     212.828        645.2     12.564     199.08     210.38    1.000     [illegible]
12.86   0.00   0.00   8295.17       0.00        0.00

        Sf=0.004142    Headloss Factor=0.100    Total Headloss=0.031 ft.

   344+57.20    8100.00      9.762      11.465     212.857        664.4     12.191     199.08     210.55    1.000     [illegible]
12.43   0.00   0.00   8258.49       0.00        0.00

        Sf=0.003777    Headloss Factor=0.100    Total Headloss=0.029 ft.

   344+61.20    8100.00      9.704      11.636     212.886        693.6     11.678     199.09     210.72    1.022     [illegible]
12.13   1.86   1.73   8296.12       7.29       10.07

        Sf=0.003349    Headloss Factor=0.100    Total Headloss=0.031 ft.

   344+65.20    8100.00      9.647      11.836     212.916        731.5     11.073     199.09     210.92    1.046     [illegible]
11.76   3.04   3.12   8290.39      30.44       51.15

        Sf=0.003385    Headloss Factor=0.100    Total Headloss=0.033 ft.

   344+69.20    8100.00      9.590      12.064     212.948        772.7     10.482     199.09     211.15    1.052     [illegible]
10.44   4.07   4.29   7591.98      69.29      121.17

        Sf=0.003441    Headloss Factor=0.100    Total Headloss=0.029 ft.

   344+73.20    8100.00      9.534      12.238     212.976        808.3     10.021     199.09     211.33    1.056     [illegible]
10.78   4.88   5.22   8030.13     116.53      206.89

        Sf=0.003056    Headloss Factor=0.100    Total Headloss=0.025 ft.

   344+77.20    8100.00      9.479      12.384     213.000        841.1      9.631     199.09     211.48    1.057     [illegible]
10.38   5.20   5.62   7880.81     160.57      286.93

        Sf=0.002744    Headloss Factor=0.100    Total Headloss=0.022 ft.

   344+81.20    8100.00      9.677      12.509     213.021        871.5      9.294     199.10     211.61    1.055     [illegible]
10.03   5.42   5.90   7733.11     205.94      369.02

        Sf=0.002486    Headloss Factor=0.100    Total Headloss=0.019 ft.

   344+85.20    8100.00      9.774      12.617     213.039        900.3      8.997     199.10     211.72    1.053     [illegible]
 9.72   5.57   6.11   7587.56     252.39      452.54

        Sf=0.002375    Headloss Factor=0.100    Total Headloss=0.005 ft.

   344+87.20    8100.[illegible]   [illegible]      12.617     213.044        899.9      9.001     199.10    [illegible]   1.055     [illegible]
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        [illegible]       Headloss Factor=[illegible]    Total Headloss=[illegible] ft.
  344+88.0          .00        9.748       12.672     213.060          915.9                   199.10     [illegible]     1.052     [illegible]
 9.46    5.65             7446.42      286.56      474.63

        Sf=0.002227    Headloss Factor=0.100    Total Headloss=0.003 ft.

  344+88.50     8100.00        9.740       12.698     213.053          923.4      8.772        199.10     [illegible]     1.051     [illegible]
 9.33    5.59    6.14     7345.30      290.10      516.13
DATA FILE : A:SUB3STAX

    STATION        Q            Dc          DEPTH        HE               AREA       VELOC        INV EL     W.S.EL        ALPHA      [illegible]
VMAIN     VLEFT       VRIGHT      QMAIN       QLEFT      QRIGHT

        Sf=0.002186    Headloss Factor=0.100    Total Headloss=0.002 ft.

  344+88.80     8100.00        9.733       12.710     213.054          927.3      8.735        199.10     211.81        1.050     [illegible]
 9.26    5.57    6.18     7297.82      291.89      535.76

        Sf=0.002172    Headloss Factor=0.100    Total Headloss=0.001 ft.

  344+89.20     8100.00        9.729       12.710     213.054          927.4      8.734        199.10     211.81        1.050     [illegible]
 9.23    5.56    6.12     7281.78      292.94      525.00

        Sf=0.002121    Headloss Factor=0.100    Total Headloss=0.008 ft.

  344+91.00     8100.00        9.690       12.758     213.061          942.1      8.598        199.10     [illegible]     [illegible]     [illegible]
 9.20    5.68    6.29     7286.41      324.13      587.44

        Sf=0.002036    Headloss Factor=0.100    Total Headloss=0.007 ft.

  344+93.20     8100.00        9.649       12.792     213.068          953.4      8.496        199.10     [illegible]     1.047     [illegible]
 9.07    5.69    6.29     7213.43      343.16      614.24

        Sf=0.001921    Headloss Factor=0.100    Total Headloss=0.014 ft.

  344+97.20     8100.00        9.549       12.867     213.082          978.6      8.277        199.10     211.77        1.044     [illegible]
 8.94    5.82    6.45     7156.78      395.90      707.33

        Sf=0.001779    Headloss Factor=0.100    Total Headloss=0.013 ft.

  345+ 1.20     8100.00        9.437       12.934     213.094         1003.0      8.076        199.11     212.04        1.040     [illegible]
 8.71    5.86    6.51     7013.51      445.02      793.38

        Sf=0.001653    Headloss Factor=0.100    Total Headloss=0.012 ft.

  345+ 5.20     8100.00        9.316       12.995     213.105         1026.7      7.889        199.11     212.10        1.037     [illegible]
 8.50    5.88    6.55     6870.83      494.72      879.89

        Sf=0.001541    Headloss Factor=0.100    Total Headloss=0.011 ft.

  345+ 9.20     8100.00        9.187       13.050     213.116         1049.8      7.716        199.11     212.16        1.034     [illegible]
 8.30    5.89    6.57     6728.06      544.93      966.73

        Sf=0.001440    Headloss Factor=0.100    Total Headloss=0.010 ft.

  345+13.20     8100.00        9.054       13.101     213.125         1072.4      7.553        199.11     [illegible]     1.030     [illegible]
 8.12    5.89    6.59     6586.17      595.62     1063.87

        Sf=0.001349    Headloss Factor=0.100    Total Headloss=0.009 ft.

  345+17.20     8100.00        8.916       13.146     213.134         1094.5      7.401        199.11     [illegible]     1.027     [illegible]
 [illegible]
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  345+21.2        0.00         8.774         13.188     213.141          1116.2                       199.12
 7.77   5.8             6298.83      698.15      1228.64

         Sf=0.00[illegible]1    Headloss Factor=0.100   Total Headloss=0.008 ft.

  345+25.20    8100.00        8.630         13.227     213.149          1137.5      7.121            199.12     [illegible]    1.021    [illegible]
 7.60   5.86   6.57    6155.57     750.06      1316.88
DATA FILE : A:SUB3STAX                                                                                                    PAGE [illegible]

   STATION          Q             Dc            DEPTH         HE            AREA         VELOC         INV EL       W.S.EL      ALPHA      [illegible]
VMAIN    VLEFT       VRIGHT       QMAIN        QLEFT       QRIGHT

         Sf=0.001123    Headloss Factor=0.100   Total Headloss=0.008 ft.

  345+29.20    8100.00        8.483         13.263     213.156          1158.6      6.991            199.12     [illegible]    1.019    [illegible]
 7.45   5.84   6.56    6012.09     802.34      1404.29

         Sf=0.001059    Headloss Factor=0.100   Total Headloss=0.007 ft.

  345+33.20    8100.00        8.336         13.296     213.163          1179.3      6.868            199.12     212.42    1.016    [illegible]
 7.30   5.82   6.54    5868.39     854.98      1492.34

         Sf=0.001001    Headloss Factor=0.100   Total Headloss=0.007 ft.

  345+37.20    8100.00        8.187         13.327     213.169          1199.9      6.751            199.12     212.45    1.014    [illegible]
 7.15   5.80   6.51    5724.49     907.95      1580.51

         Sf=0.000948    Headloss Factor=0.100   Total Headloss=0.006 ft.

  345+41.20    8100.00        8.039         13.356     213.175          1220.1      6.639            199.13     212.48    1.012    [illegible]
 7.01   5.77   6.48    5580.40     961.22      1668.76

         Sf=0.000898    Headloss Factor=0.100   Total Headloss=0.006 ft.

  345+45.20    8100.00        7.891         13.383     213.180          1240.2      6.531            199.13     212.51    1.011    [illegible]
 6.87   5.74   6.45    5436.17     1014.77     1757.07

         Sf=0.000852    Headloss Factor=0.100   Total Headloss=0.006 ft.

  345+49.20    8100.00        7.744         13.408     213.186          1260.1      6.428            199.13     [illegible]    1.009    [illegible]
 6.74   5.71   6.42    5291.79     1068.59     1845.41

         Sf=0.000613    Headloss Factor=0.100   Total Headloss=0.029 ft.

  345+59.00    8100.00        6.852         13.664     213.215          1567.7      5.167            199.13     [illegible]    1.002    [illegible]
 5.86   5.65   6.13    4572.79     1905.28     2759.80

         Sf=0.000483    Headloss Factor=0.100   Total Headloss=0.007 ft.

  345+69.20    8100.00        6.949         13.647     213.222          1531.8      5.288            199.14     [illegible]    1.003    [illegible]
 5.20   4.99   5.44    3898.99     1648.29     2452.84

         Sf=0.000521    Headloss Factor=0.100   Total Headloss=0.015 ft.

  345+89.20    8100.00        7.158         13.608     213.237          1460.5      5.546            199.15     [illegible]    1.005    [illegible]
 5.37   5.13   5.64    3724.68     1619.69     2548.48

         Sf=0.000563    Headloss Factor=0.100   Total Headloss=0.008 ft.

  345+99.20    8100.00        7.268         13.587     213.246          1424.8      5.685            199.16     [illegible]    1.004    [illegible]
 5.58   5.31   5.86    3705.35     [illegible]     2650.31
 5.78   5.47              [illegible]     [illegible]     2758.65

          Sf=[illegible]      Headloss Factor=0.000    Total Headloss=0.009 ft.

  346+33.00    8100.00       7.677       13.498     213.273        1302.5      6.219       199.17     [illegible]   [illegible]   [illegible]
 6.04   5.69   6.40    3430.69    1611.21    2890.82
DATA FILE : A:SUB3STAX

   STATION          Q          Dc          DEPTH        HE            AREA      VELOC       INV EL      W.S.EL        ALPHA       [illegible]
VMAIN    VLEFT       VRIGHT      QMAIN      QLEFT      QRIGHT

          Sf=0.000705     Headloss Factor=0.100    Total Headloss=0.005 ft.

  346+39.20    8100.00       7.685       13.496     213.278        1299.1      6.235       199.18      212.67       1.006       [illegible]
 6.18   5.80   6.54    3507.68    1619.15    2961.33

          Sf=0.000713     Headloss Factor=0.100    Total Headloss=0.015 ft.

  346+59.20    8100.00       7.711       13.492     213.295        1288.3      6.287       199.19      212.68       1.007       [illegible]
 6.22   5.78   6.59    3627.42    1536.99    2997.31

          Sf=0.000727     Headloss Factor=0.100    Total Headloss=0.016 ft.

  346+79.20    8100.00       7.738       13.486     213.311        1277.3      6.341       199.20      212.68       1.008       [illegible]
 6.27   5.77   6.66    3658.77    1458.96    3043.36

          Sf=0.000741     Headloss Factor=0.100    Total Headloss=0.016 ft.

  346+99.20    8100.00       7.765       13.481     213.327        1266.4      6.396       199.21      212.69       1.009       [illegible]
 6.33   5.75   6.73    3590.71    1380.07    3090.23

          Sf=0.000756     Headloss Factor=0.100    Total Headloss=0.016 ft.

  347+19.20    8100.00       7.793       13.476     213.343        1255.5      6.452       199.22      212.69       1.010       [illegible]
 6.39   5.73   6.80    3622.96    1300.25    3137.73

          Sf=0.000771     Headloss Factor=0.100    Total Headloss=0.017 ft.

  347+39.20    8100.00       7.819       13.465     213.361        1244.1      6.511       199.23      212.69       1.011       [illegible]
 6.45   5.70   6.87    3652.77    1219.81    3186.49

          Sf=0.000796     Headloss Factor=0.100    Total Headloss=0.020 ft.

  347+57.00    8100.00       7.974       13.418     213.381        1238.2      6.542       199.24      212.66       1.089       [illegible]
 7.63   4.81   5.80    4305.94    1023.76    2678.96

          Sf=0.000810     Headloss Factor=0.100    Total Headloss=0.003 ft.

  347+59.20    8100.00       7.959       13.428     213.383        1246.3      6.505       199.24      212.67       1.089       [illegible]
 7.70   4.89   5.86    4347.78    1073.25    2702.44

          Sf=0.000790     Headloss Factor=0.100    Total Headloss=0.015 ft.

  347+72.00    8100.00       7.822       13.488     213.398        1246.2      6.500       199.25      212.73       1.011       [illegible]
 6.54   5.77   6.96    3707.93    1240.21    3230.47

          Sf=0.000763     Headloss Factor=0.100    Total Headloss=0.007 ft.

  347+79.20    8100.00       7.787       13.513     213.405        1261.8      6.420       199.25      212.76       1.010       [illegible]
 6.44   5.76   6.85    3658.38    1315.98    3184.79

          Sf=0.000[illegible]                              Total Headloss=0.016 ft.
 6.37    5.75    [illegible]

          Sf              Headloss Factor=0.000     Total Headloss=[illegible] ft.

   351+99.20   [illegible]0.00     7.472       13.713     213.679        1413.4      5.731       199.46     [illegible]    [illegible]
 6.00    5.93    6.35   [illegible]60.68    2205.47     2952.15
DATA FILE : A:SUB3STAX

    STATION          Q             Dc          DEPTH        HE              AREA      VELOC       INV EL     [illegible]    ALPHA      [illegible]
VMAIN      VLEFT       VRIGHT      QMAIN       QLEFT       QRIGHT

          Sf=0.000642     Headloss Factor=0.100     Total Headloss=0.085 ft.

   353+30.00     8100.00       7.918       13.588     213.765        1297.6      6.242       199.52     [illegible]    [illegible]
 7.62    6.19     5.68     4355.97     1569.01     2406.10

          Sf=0.000650     Headloss Factor=0.100     Total Headloss=0.061 ft.

   354+20.00     8100.00       8.151       13.491     213.827        1212.9      6.678       199.57     213.06    1.114
 7.21    4.92     3.27     6317.02     1149.43      336.53

          Sf=0.000590     Headloss Factor=0.100     Total Headloss=0.017 ft.

   354+46.00     8100.00       7.906       13.607     213.843        1210.7      6.690       199.58     213.09    1.090
 7.31    5.00     2.36     6930.90     1076.10      110.80

          Sf=0.000587     Headloss Factor=0.100     Total Headloss=0.009 ft.

   354+60.00     8100.00       7.898       13.620     213.852        1212.0      6.683       199.59     [illegible]    1.076
 7.17    4.66     1.65     7232.70      832.68       40.18

          Sf=0.000561     Headloss Factor=0.100     Total Headloss=0.029 ft.

   355+00.00     8100.00       7.633       13.595     213.880        1250.8      6.476       199.61     [illegible]    1.044
 6.86    3.54     0.00     7952.30      324.28        0.00

          Sf=0.000510     Headloss Factor=0.100     Total Headloss=0.014 ft.

   355+20.00     8100.00       7.326       13.635     213.893        1282.3      6.317       199.62     213.25    1.037
 6.65    2.79     0.00     8147.46      159.31        0.00

          Sf=0.000462     Headloss Factor=0.100     Total Headloss=0.013 ft.

   355+40.00     8100.00       7.131       13.676     213.906        1314.1      6.164       199.63     213.30    1.025
 6.41    1.95     0.00     8236.02       55.99        0.00

          Sf=0.000435     Headloss Factor=0.100     Total Headloss=0.025 ft.

   355+80.00     8100.00       6.774       13.758     213.931        1390.0      5.827       199.65     213.40    1.000
 5.87    0.00     0.00     8155.43        0.00        0.00

          Sf=0.000403     Headloss Factor=0.100     Total Headloss=0.017 ft.

   356+10.00     8100.00       6.532       13.812     213.948        1464.1      5.532       199.66     213.47    1.000
 5.70    0.00     0.00     8350.35        0.00        0.00

          Sf=0.000508     Headloss Factor=0.300     Total Headloss=0.010 ft.

   356+20.00     8100.00       6.455       13.832     213.957        1489.2      5.439       199.67     [illegible]    [illegible]
 4.59    0.00     0.00     6829.80        0.00        0.00

          Sf=0.000516     Headloss Factor=0.000     Total Headloss=0.004 ft.
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         Sf= [illegible]     Headloss Factor=0.000    Total Headloss=0.013 ft.

   356+60.00          .00         7.313        17.963     213.974        1793.6                    195.70     [illegible]     1.000     [illegible]
 4.51    0.00           8085.95         0.00         0.00
DATA FILE : A:SUB3STAX

     STATION          Q             Dc           DEPTH         HE           AREA        VELOC          INV EL     [illegible]     ALPHA     [illegible]
VMAIN      VLEFT         VRIGHT       QMAIN        QLEFT       QRIGHT

         Sf=0.000336     Headloss Factor=0.300    Total Headloss=0.014 ft.

   357+ 0.00     8100.00      7.313        17.910     213.989        1787.8       4.531          195.76     213.67     1.000     [illegible]
 4.87    0.00     0.00      8704.88         0.00         0.00

         Sf=0.000375     Headloss Factor=0.300    Total Headloss=0.052 ft.

   357+10.00     8100.00      7.699        16.135     214.041        1458.3       6.555          197.43     [illegible]     1.000     [illegible]
 4.80    0.00     0.00      7004.14         0.00         0.00

         Sf=0.000671     Headloss Factor=0.300    Total Headloss=0.093 ft.

   357+20.00     8100.00      8.133        14.275     214.135        1152.8       7.026          199.09     [illegible]     1.000     [illegible]
 5.93    0.00     0.00      6835.99         0.00         0.00

         Sf=0.001340     Headloss Factor=0.300    Total Headloss=0.194 ft.

   357+30.00     8100.00      8.624        12.201     214.329         862.8       9.388          200.76     212.96     1.000     [illegible]
 7.58    0.00     0.00      6541.93         0.00         0.00
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8100 CFS DATA ONLY

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FILE NAME = A:SUB2STAX                                   PAGE  1
   STATION        FLOW        BMAIN       BLEFT      BRIGHT      INVMAIN      INVLEFT      INVRIGHT
          NMAIN       NLEFT       NRIGHT      ZLEFT       ZRIGHT       ZCLEFT       ZCRIGHT      FORMLOSS

 317+ 9.20       8100.0       30.00       16.00       17.00       193.47       209.50       208.30
          0.030       0.025       0.025       2.000       2.000        2.000        2.000        0.00

 317+49.20       8100.0       30.00       15.47       17.00       193.49       206.07       204.92
          0.030       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 317+69.20       8100.0       33.25       15.20       17.00       193.50       204.36       203.23
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 317+89.20       8100.0       36.50       14.94       17.00       193.51       202.63       201.54
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+ 9.20       8100.0       39.75       14.67       17.00       193.52       200.91       199.85
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+29.20       8100.0       43.00       14.41       17.00       193.53       199.20       198.15
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+49.20       8100.0       46.25       14.14       17.00       193.54       197.48       196.46
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+60.00       8100.0       48.00       14.00       17.00       193.55       196.55       195.55
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+69.20       8100.0       46.50       14.00       17.00       193.55       196.55       195.55
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+89.20       8100.0       43.24       14.00       17.00       193.56       196.56       195.56
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 318+99.20       8100.0       41.61       14.00       17.00       193.57       196.57       195.57
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 319+19.20       8100.0       38.35       14.00       17.23       193.58       196.58       195.58
          0.035       0.025       0.025       2.000       2.000        2.000        2.000        0.10

 319+39.20       8100.0       35.09       14.00       17.47       193.59       196.59       195.59
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  STATION             FLOW           BMAIN          BLEFT          BRIGHT         IN                INVLEFT        INVRIGHT
                              NLEFT          NRIGHT         ZLEFT          ZRIGHT          LEFT          ZCRIGHT          FORMLOSS


 319+52.00          8100.0          33.00          14.00          17.62          193.60          196.60          195.60
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 319+59.20          8100.0          33.00          14.00          17.70          193.60          196.60          195.60
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 319+79.20          8100.0          33.00          14.00          17.93          193.61          196.61          195.61
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 319+99.20          8100.0          33.00          15.00          18.17          193.62          196.62          195.62
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 320+19.20          8100.0          33.00          14.80          21.00          193.63          196.63          195.63
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 320+39.20          8100.0          33.00          14.60          22.00          193.64          196.64          195.64
              0.035          0.025          0.026          2.000          2.000          2.000          2.000          0.10

 320+59.20          8100.0          33.00          15.00          23.00          193.65          196.65          195.65
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 320+79.20          8100.0          33.00          14.00          24.00          193.66          196.66          195.66
              0.030          0.025          0.025          2.000          2.000          2.000          2.000          0.10

 320+99.20          8100.0          33.00          16.00          24.00          193.67          196.67          195.67
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.00

 321+15.00          8100.0          33.00          16.00          24.00          193.68          196.68          195.68
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.00

 324+99.20          8100.0          33.00          10.00          24.00          193.87          196.87          195.87
              0.035          0.025          0.025          2.000          2.000          2.000          2.000          0.00

 327+49.00          8100.0          33.00          10.00          22.00          193.99          196.99          195.99
              0.035          0.035          0.025          2.000          2.000          2.000          2.000          0.00

 328+99.20          8100.0          33.00          10.00          21.00          194.07          197.07          196.07
              0.035          0.035          0.025          2.000          2.000          2.000          2.000          0.00
FILE NAME =  A:SUB2STAX                                                  PAGE  3

  STATION             FLOW           BMAIN          BLEFT          BRIGHT         INVMAIN          INVLEFT        INVRIGHT
              NMAIN          NLEFT          NRIGHT         ZLEFT          ZRIGHT          ZCLEFT          ZCRIGHT          FORMLOSS
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  333+63.00   [illegible]100.0          33.00          10.00          21.00        194.3[illegible]       197.30      [illegible]
       [illegible]        0.025          0.025          2.000          2.000          2.000          2.000            0.00

  334+80.00        8100.0          33.00          10.00          21.00        194.36         197.36        196.36
       0.035          0.025          0.035          2.000          2.000          2.000          2.000            0.00

  336+99.20        8100.0          33.00          10.00          21.00        194.47         197.47        196.47
       0.035          0.025          0.035          2.000          2.000          2.000          2.000            0.00

  340+ 0.00        8100.0          33.00          10.00          19.00        194.62         197.62        196.62
       0.035          0.025          0.035          2.000          2.000          2.000          2.000            0.00

  340+24.00        8100.0          33.00          10.00          17.00        194.63         197.63        196.46
       0.035          0.025          0.035          2.000          2.000          2.000          2.000            0.10

  340+80.00        8100.0          37.38          10.00          21.00        194.66         202.41        196.09
       0.035          0.025          0.035          2.000          2.000          2.000          2.000            0.10

  341+20.00        8100.0          40.50          10.00          17.00        194.68         205.82        195.83
       0.035          0.025          0.035          2.000          2.000          2.000          2.000            0.10

  341+30.00        8100.0          41.28          10.00          17.00        194.69         206.67        195.76
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.00

  341+60.00        8100.0          43.63          10.00          17.00        194.70         209.24        195.56
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.10

  341+95.00        8100.0          46.36          10.00          17.00        194.71         212.22        195.33
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.00

  342+ 0.00        8100.0          46.75          10.00          17.59        194.72         212.65        195.30
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.10

  342+24.00        8100.0          48.63          10.00          20.41        194.73         214.70        195.14
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.00
FILE NAME =  A:SUB2STAX                                                   PAGE  4
   STATION          FLOW           BMAIN          BLEFT          BRIGHT       INVMAIN        INVLEFT       INVRIGHT
       NMAIN          NLEFT          NRIGHT         ZLEFT          ZRIGHT         ZCLEFT         ZCRIGHT          FORMLOSS


  342+40.00        8100.0          49.88          10.00          22.29        194.74         214.70        195.04
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.10

  342+80.00        8100.0          53.00          10.00          27.00        194.76         214.70        194.76
       0.035          0.025          0.025          2.000          2.000          2.000          2.000            0.30
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342+88.00        100.0             64.00         10.00         0.10      190.7          214.70       190.7
            0.035        0.025             0.035        2.000         2.000         2.000        2.000          0.00

343+18.00       8100.0             64.00         10.00         0.10      190.80         214.70       190.80
            0.035        0.025             0.035        2.000         2.000         2.000        2.000          0.00

343+48.00       8100.0             64.00         10.00         0.10      190.84         214.70       190.84
            0.035        0.025             0.035        2.000         2.000         2.000        2.000          0.00

343+60.00       8100.0             64.00         10.00         0.10      190.86         214.70       190.86
            0.030        0.025             0.030        2.000         2.000         2.000        2.000          0.30

343+70.00       8100.0             57.90         10.00         0.10      192.53         214.70       192.53
            0.030        0.025             0.030        2.000         2.000         2.000        2.000          0.30

343+80.00       8100.0             51.80         10.00         0.10      194.19         214.70       194.19
            0.030        0.025             0.030        2.000         2.000         2.000        2.000          0.30

343+90.00       8100.0             45.71         10.00         0.10      195.86         214.70       195.86
            0.030        0.025             0.030        2.000         2.000         2.000        2.000          0.30

344+ 0.00       8100.0             39.61         10.00         0.10      197.53         214.70       197.53
            0.030        0.025             0.030        2.000         2.000         2.000        2.000          0.30

344+ 9.20       8100.0             34.00         10.00         0.10      199.06         214.70       199.06
            0.030        0.025             0.030        2.000         2.000         2.000        2.000          0.30
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8100 CFS   DATA ONLY   UPSTREAM OF 3A-5 DROP

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FILE NAME =   A:SUB3STAX                                                          PAGE  1

  STATION            FLOW               BMAIN          BLEFT          BRIGHT         INVMAIN        INVLEFT        INVRIGHT
             NMAIN             NLEFT             NRIGHT         ZLEFT          ZRIGHT              ZCLEFT          ZCRIGHT          FORMLOSS


  344+ 9.20        8100.0           34.00          10.00          17.00         199.06         214.70         215.30
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.00

  344+13.20        8100.0           34.00          10.00          17.00         199.06         214.36         214.92
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.00

  344+17.20        8100.0           34.00          10.00          17.00         199.06         214.03         214.54
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.00

  344+21.20        8100.0           34.00          10.00          17.00         199.07         213.69         214.17
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.00

  344+25.20        8100.0           34.00          10.00          17.00         199.07         213.36         213.79
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.00

  344+29.20        8100.0           34.00          10.00          17.00         199.07         213.02         213.41
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.00

  344+33.20        8100.0           34.00          10.00          17.00         199.07         212.69         213.03
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.10

  344+37.20        8100.0           34.00          10.00          17.00         199.07         212.35         212.65
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.10

  344+41.20        8100.0           34.00          10.00          17.00         199.08         212.02         212.28
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.10

  344+45.20        8100.0           34.00          10.00          17.00         199.08         211.68         211.90
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.10

  344+49.20        8100.0           34.00          10.00          17.00         199.08         211.35         211.52
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.10

  344+53.20        8100.0           34.51          10.00          17.00         199.08         211.01         211.14
            0.030            0.025            0.025          2.000          2.000              2.000           2.000            0.10
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 STATION            FLOW          BMAIN         BLEFT        BRIGHT        IN                 INVLEFT          INVRIGHT
                            NLEFT         NRIGHT        ZLEFT        ZRIGHT                 LEFT          ZCRIGHT          FORMLOSS

 344+61.20         8100.0          35.53         10.00        17.00          199.09          210.34           210.39
           0.030          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+65.20         8100.0          36.04         10.00        17.00          199.09          210.01           210.01
           0.030          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+69.20         8100.0          36.55         10.00        17.00          199.09          209.67           209.63
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+73.20         8100.0          37.06         10.00        17.00          199.09          209.34           209.25
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+77.20         8100.0          37.57         10.00        17.00          199.09          209.00           208.87
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+81.20         8100.0          38.08         10.00        17.00          199.10          208.67           208.50
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+85.20         8100.0          38.59         10.00        17.00          199.10          208.33           208.12
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+87.20         8100.0          38.85         10.00        17.00          199.10          208.15           208.44
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+88.00         8100.0          38.95         10.00        17.00          199.10          208.07           208.00
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+88.50         8100.0          39.01         10.00        17.00          199.10          208.03           207.80
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+88.80         8100.0          39.05         10.00        17.00          199.10          208.01           207.70
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+89.20         8100.0          39.10         10.00        17.00          199.10          208.00           207.74
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10

 344+91.00         8100.0          39.33         10.00        17.00          199.10          207.80           207.49
           0.035          0.025          0.025         2.000        2.000          2.000           2.000            0.10
FILE NAME =  A:SUB3STAX                                                      PAGE  3
 STATION            FLOW          BMAIN         BLEFT        BRIGHT        INVMAIN          INVLEFT          INVRIGHT
           NMAIN            NLEFT         NRIGHT        ZLEFT        ZRIGHT          ZCLEFT          ZCRIGHT          FORMLOSS
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  344+97.20        100.0             40.12             10.00             17.00            199.1            207.33            206.98
                                  0.025             0.025             2.000             2.000             .000             2.000             0.10

  345+ 1.20       8100.0             40.63             10.00             17.00            199.11            206.99            206.61
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+ 5.20       8100.0             41.14             10.00             17.00            199.11            206.66            206.23
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+ 9.20       8100.0             41.65             10.00             17.00            199.11            206.32            205.85
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+13.20       8100.0             42.16             10.00             17.00            199.11            205.98            205.47
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+17.20       8100.0             42.67             10.00             17.00            199.11            205.65            205.09
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+21.20       8100.0             43.18             10.00             17.00            199.12            205.31            204.72
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+25.20       8100.0             43.69             10.00             17.00            199.12            204.98            204.34
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+29.20       8100.0             44.20             10.00             17.00            199.12            204.64            203.96
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+33.20       8100.0             44.71             10.00             17.00            199.12            204.31            203.58
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+37.20       8100.0             45.22             10.00             17.00            199.12            203.97            203.20
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+41.20       8100.0             45.73             10.00             17.00            199.13            203.64            202.83
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10
FILE NAME =  A:SUB3STAX                                                             PAGE  4

   STATION            FLOW              BMAIN              BLEFT             BRIGHT           INVMAIN           INVLEFT           INVRIGHT
                NMAIN             NLEFT             NRIGHT             ZLEFT             ZRIGHT            ZCLEFT            ZCRIGHT           FORMLOSS



  345+45.20       8100.0             46.24             10.00             17.00            199.13            203.30            202.45
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10

  345+49.20       8100.0             46.75             10.00             17.00            199.13            202.97            202.07
                0.035             0.025             0.025             2.000             2.000             2.000             2.000             0.10
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 345+69.20   8100.0      45.93     20.38     27.11    199.[illegible]    202.15    201.15
          [illegible]    0.025      0.025     2.000    2.000     2.000     2.000      0.10

 345+89.20   8100.0      41.88     19.16     27.34    199.15    202.16    201.16
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 345+99.20   8100.0      39.85     16.55     27.45    199.16    202.16    201.16
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 346+19.20   8100.0      35.80     17.33     27.67    199.16    202.17    201.17
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 346+33.00   8100.0      33.00     16.48     27.82    199.17    202.18    201.18
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.00

 346+39.20   8100.0      33.00     16.10     27.89    199.18    202.18    201.18
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 346+59.20   8100.0      33.00     14.88     28.11    199.19    202.19    201.19
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 346+79.20   8100.0      33.00     13.66     28.33    199.20    202.20    201.20
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 346+99.20   8100.0      33.00     12.44     28.56    199.21    202.21    201.21
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 347+19.20   8100.0      33.00     11.22     28.78    199.22    202.22    201.22
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10
FILE NAME = A;SUB3STAX                                  PAGE   5

  STATION      FLOW       BMAIN     BLEFT    BRIGHT   INVMAIN   INVLEFT   INVRIGHT
          NMAIN     NLEFT     NRIGHT     ZLEFT    ZRIGHT    ZCLEFT   ZCRIGHT    FORMLOSS


 347+39.20   8100.0      33.00     10.00     29.00    199.23    202.23    201.23
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10

 347+57.00   8100.0      33.00     10.00     29.00    199.24    202.24    201.24
          0.030     0.030      0.030     2.000    2.000     2.000     2.000      0.10

 347+59.20   8100.0      33.00     10.61     28.96    199.24    202.24    201.24
          0.030     0.030      0.030     2.000    2.000     2.000     2.000      0.10

 347+72.00   8100.0      33.00     10.00     28.93    199.25    202.25    201.25
          0.035     0.025      0.025     2.000    2.000     2.000     2.000      0.10
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            0.035           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   347+99.20         8100.0           33.00           11.83          28.87         199.2          202.26          201.26
            0.035           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   351+99.20         8100.0           33.00           24.00          28.00         199.46         202.46          201.46
            0.035           0.025           0.025          2.000          2.000          2.000          2.000            0.00

   353+30.00         8100.0           33.00           18.00          25.00         199.52         202.53          201.53
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   354+20.00         8100.0           47.59           11.79          18.79         199.57         202.57          208.62
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   354+46.00         8100.0           51.80           10.00          17.00         199.58         202.58          210.67
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   354+60.00         8100.0           54.07           10.00          17.00         199.59         203.83          211.77
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   355+ 0.00         8100.0           60.55           10.00          17.00         199.61         207.40          214.93
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   355+20.00         8100.0           63.79           10.00          17.00         199.62         209.19          216.50
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10
  FILE NAME =   A:SUB3STAX                                                          PAGE   6

     STATION            FLOW           BMAIN           BLEFT          BRIGHT         INVMAIN        INVLEFT         INVRIGHT
            NMAIN           NLEFT           NRIGHT         ZLEFT          ZRIGHT         ZCLEFT         ZCRIGHT         FORMLOSS


   355+40.00         8100.0           67.03           10.00          17.00         199.63         210.97          216.50
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   355+80.00         8100.0           73.52           10.00          17.00         199.65         214.55          216.51
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   356+10.00         8100.0           78.38           10.00          17.00         199.66         217.50          216.51
            0.025           0.025           0.025          2.000          2.000          2.000          2.000            0.10

   356+20.00         8100.0           80.00           10.00          17.00         199.67         217.50          216.51
            0.035           0.025           0.025          2.000          2.000          2.000          2.000            0.30

   356+28.00         8100.0           64.00           10.00          17.00         195.66         217.50          216.51
            0.035           0.025           0.025          2.000          2.000          2.000          2.000            0.00

   356+60.00         8100.0           64.00           10.00          17.00         195.70         217.51          216.51
            0.035           0.025           0.025          2.000          2.000          2.000          2.000            0.00
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           0.030        0.025         0.025     2.000      2.000      2.000      2.000           0.30
357+10.00        100.0         58.11        10.00     17.00      197.4          217.51     216.52
           0.030        0.025         0.025     2.000      2.000      2.000      2.000           0.30
357+20.00        8100.0        52.21        10.00     17.00      199.09         217.51     216.52
           0.030        0.025         0.025     2.000      2.000      2.000      2.000           0.30
357+30.00        8100.0        46.32        10.00     17.00      200.76         217.51     216.52
           0.030        0.025         0.025     2.000      2.000      2.000      2.000           0.30
357+40.00        8100.0        40.42        10.00     17.00      202.43         217.51     216.52
           0.030        0.025         0.025     2.000      2.000      2.000      2.000           0.30
357+49.20        8100.0        35.00        10.00     17.00      203.96         217.51     216.52
           0.030        0.025         0.025     2.000      2.000      2.000      2.000           0.30
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WATER SURFACE PROFILE FOR 5000 cfs

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DATA FILE : A:SUB3STA5

          SUBCRITICAL WATER SURFACE PROFILE

              LLAGAS CREEK REACH 3A-5

                   STABILITY      5,000 CFS

 COMPUTED BY:  D. HALLSTROM    DATE:   7/27/91    CHECKED BY:______________________     DATE:______________

    STATION         Q              Dc          DEPTH        HE              AREA        VELOC         INV EL       W.S.EL      ALPHA       E.G. EL
VMAIN     VLEFT        VRIGHT      QMAIN       QLEFT       QRIGHT

   317+ 9.20    5000.00        7.923         7.920      204.336          363.1      13.772         193.47       201.39      1.000       [illegible]
 0.00     0.00     0.00         0.00        0.00        0.00

        Sf=0.005745     Headloss Factor=0.100     Total Headloss=0.331 ft.

   317+49.20    5000.00        7.923         9.242      204.665          448.1      11.159         193.49       202.73      1.000       [illegible]
12.78     0.00     0.00     5727.26         0.00        0.00

        Sf=0.003779     Headloss Factor=0.100     Total Headloss=0.128 ft.

   317+69.20    5000.00        7.579         9.878      204.792          526.2       9.503         193.50       203.38      1.008       [illegible]
10.22     0.00     1.03     5352.36         0.00        2.67

        Sf=0.002698     Headloss Factor=0.100     Total Headloss=0.100 ft.

   317+89.20    5000.00        7.264        10.432      204.892          658.9       7.589         193.51       203.94      1.063       [illegible]
 8.74     3.47     5.04     5166.32        74.01      236.29

        Sf=0.001723     Headloss Factor=0.100     Total Headloss=0.064 ft.

   318+ 9.20    5000.00        7.222        10.779      204.955          786.3       6.359         193.52       204.30      1.044       [illegible]
 7.59     4.84     5.74     4779.19       296.23      648.21

        Sf=0.001105     Headloss Factor=0.100     Total Headloss=0.038 ft.

   318+29.20    5000.00        6.816        10.970      204.993          896.7       5.576         193.53       204.50      1.02[illegible]     [illegible]
 6.44     4.96     5.58     4149.91       519.07      827.26

        Sf=0.000767     Headloss Factor=0.100     Total Headloss=0.025 ft.

   318+49.20    5000.00        6.060        11.085      205.018          998.3       5.009         193.54       204.63      1.007       [illegible]
 5.60     4.85     5.33     3589.84       737.49     1094.60

        Sf=0.000600     Headloss Factor=0.100     Total Headloss=0.010 ft.

   318+60.00    5000.00        5.637        11.125      205.028         1050.4       4.760         193.55       204.67      1.00[illegible]     [illegible]
 5.04     4.58     5.00     3188.57       823.98     1192.78

        Sf=0.000664     Headloss Factor=0.100     Total Headloss=0.006 ft.
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         Sf=      [illegible]   Headloss Factor=0.100    Total Headloss=0.015 ft.

   318+89.2   [illegible]0.00      5.852       11.091    205.060          993.4                  193.56     [illegible]    1.00[illegible]     [illegible]
 5.02   4.5[illegible]   [illegible]    2896.16     816.56     1183.15

         Sf=0.000638    Headloss Factor=0.100    Total Headloss=0.008 ft.

   318+99.20    5000.00      5.930       11.078    205.059          973.8     5.134        193.57     204.[illegible]    1.003     [illegible]
 5.17   4.71   5.15    2887.65     840.40     1218.12
DATA FILE : A:SUB2STA5                                                                                       PAGE 3

    STATION         Q           Dc          DEPTH         HE          AREA      VELOC        INV EL     W.S.EL     ALPHA     CRIT. EL
VMAIN   VLEFT       VRIGHT      QMAIN       QLEFT       QRIGHT

         Sf=0.000679    Headloss Factor=0.100    Total Headloss=0.017 ft.

   319+19.20    5000.00      6.085       11.053    205.076          936.9     5.337        193.58     204.63     1.003     [illegible]
 5.31   4.85   5.31    2770.45     862.02     1263.78

         Sf=0.000739    Headloss Factor=0.100    Total Headloss=0.019 ft.

   319+39.20    5000.00      6.251       11.025    205.096          899.9     5.556        193.59     204.61     1.004     [illegible]
 5.52   5.06   5.54    2672.92     893.82     1324.96

         Sf=0.000795    Headloss Factor=0.100    Total Headloss=0.013 ft.

   319+52.00    5000.00      6.362       11.006    205.109          876.2     5.707        193.60     204.60     1.004     [illegible]
 5.71   5.24   5.75    2627.65     922.33     1377.70

         Sf=0.000817    Headloss Factor=0.100    Total Headloss=0.006 ft.

   319+59.20    5000.00      6.359       11.009    205.115          877.2     5.700        193.60     204.61     1.004     [illegible]
 5.79   5.31   5.83    2665.30     935.77     1402.92

         Sf=0.000812    Headloss Factor=0.100    Total Headloss=0.017 ft.

   319+79.20    5000.00      6.351       11.018    205.131          880.4     5.679        193.61     204.63     1.004     [illegible]
 5.77   5.30   5.83    2660.90     934.97     1415.97

         Sf=0.000794    Headloss Factor=0.100    Total Headloss=0.017 ft.

   319+99.20    5000.00      6.323       11.039    205.147          892.8     5.600        193.62     204.66     1.00[illegible]     [illegible]
 5.72   5.29   5.78    2640.61     980.39     1421.22

         Sf=0.000751    Headloss Factor=0.100    Total Headloss=0.018 ft.

   320+19.20    5000.00      6.236       11.076    205.165          920.9     5.429        193.63     204.71     1.004     [illegible]
 5.57   5.15   5.74    2581.54     951.23     1565.64

         Sf=0.000713    Headloss Factor=0.100    Total Headloss=0.015 ft.

   320+39.20    5000.00      6.208       11.089    205.179          929.9     5.377        193.64     204.[illegible]3     1.005     [illegible]
 5.44   5.01   5.63    2521.03     920.14     1590.05

         Sf=0.000691    Headloss Factor=0.100    Total Headloss=0.015 ft.

   320+59.20    5000.00      6.171       11.107    205.194          944.3     5.295        193.65     204.76     1.005     [illegible]
 5.36   4.96   5.58    2488.45     928.85     1630.34

         Sf=0.000611    Headloss Factor=0.100    Total Headloss=0.013 ft.

   [illegible]    5000.0[illegible]      [illegible]       [illegible]150    205.207          [illegible]     [illegible]        [illegible]     [illegible]    [illegible]     [illegible]
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         Sf=0.00[illegible]597     Headloss Factor=0.000     Total Headloss=0.012 ft.

   320+99.2[illegible]     [illegible]00        6.124        11.129     205.218          964.1                     193.67        [illegible]      1.006       [illegible]
 4.98    4.6      [illegible]     2320.61      912.88      1577.57

         Sf=0.000644     Headloss Factor=0.000     Total Headloss=0.010 ft.

   321+15.00       5000.00        6.124        11.131     205.228          964.4        5.185        193.68        204.81      1.005       [illegible]
 5.18    4.84     5.42     2412.05      949.00      1639.89
DATA FILE : A:SUB2STA5

     STATION          Q            Dc          DEPTH           HE                AREA        VELOC         INV EL        W.S.EL      ALPHA       F.B. EL
VMAIN     VLEFT        VRIGHT        QMAIN       QLEFT        QRIGHT


         Sf=0.000679     Headloss Factor=0.000     Total Headloss=0.261 ft.

   324+99.20       5000.00        6.232        11.154     205.488          918.1        5.446        193.87        205.02      1.009       [illegible]
 5.32    4.67     5.57     2484.41      691.76      1690.82

         Sf=0.000762     Headloss Factor=0.000     Total Headloss=0.190 ft.

   327+49.00       5000.00        6.343        11.176     205.678          902.3        5.541        193.99        205.17      1.063       [illegible]
 5.65    3.54     5.85     2642.15      526.56      1673.32

         Sf=0.000817     Headloss Factor=0.000     Total Headloss=0.123 ft.

   328+99.20       5000.00        6.378        11.219     205.800          897.7        5.570        194.07        205.29      1.063       [illegible]
 5.87    3.68     6.04     2763.69      550.86      1681.53

         Sf=0.000802     Headloss Factor=0.000     Total Headloss=0.321 ft.

   332+99.20       5000.00        6.378        11.356     206.121          912.7        5.479        194.27        205.63      1.063       208.00
 5.86    3.68     6.03     2785.08      563.91      1711.69

         Sf=0.000743     Headloss Factor=0.000     Total Headloss=0.047 ft.

   333+63.00       5000.00        6.330        11.402     206.168          917.7        5.448        194.30        205.70      1.058       [illegible]
 5.66    4.97     5.82     2699.05      768.18      1662.39

         Sf=0.000774     Headloss Factor=0.000     Total Headloss=0.091 ft.

   334+80.00       5000.00        6.419        11.415     206.258          919.2        5.440        194.36        205.78      1.050       [illegible]
 5.78    5.08     4.24     2761.04      786.75      1215.46

         Sf=0.000841     Headloss Factor=0.000     Total Headloss=0.184 ft.

   336+99.20       5000.00        6.419        11.499     206.442          928.4        5.386        194.47        205.97      1.050       [illegible]
 6.05    5.32     4.44     2913.20      836.13      1287.41

         Sf=0.000832     Headloss Factor=0.000     Total Headloss=0.250 ft.

   340+ 0.00       5000.00        6.485        11.588     206.692          919.0        5.441        194.62        206.21      1.055       [illegible]
 6.05    5.32     4.39     2936.93      849.37      1202.36

         Sf=0.000850     Headloss Factor=0.100     Total Headloss=0.022 ft.

   340+24.00       5000.00        6.513        11.585     206.715          902.3        5.541        194.63        [illegible]      1.054       [illegible]
 6.12    5.38     4.41     2960.99      857.29      1149.99

         Sf=0.000840     Headloss Factor=0.100     Total Headloss=0.053 ft.

   340+80.00       5000.00        6.151        11.673     206.767          963.0        5.192        194.66        206.33      1.049       [illegible]
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  341+20.00     [illegible].00    [illegible]     11.667     206.805          928.7                194.6[illegible]   [illegible]   [illegible]   [illegible]
 5.53   1.0     [illegible]   3007.87          5.92    1340.28

        Sf=[illegible]0882    Headloss Factor=0.000    Total Headloss=0.009 ft.

  341+30.00     5000.00        5.965        11.652     206.814          932.4      5.362     194.69     206.34     1.057      [illegible]
 4.97   1.10   6.67    3186.22          5.98    1916.04
DATA FILE : A:SUB2STA5                                                                                           PAGE 3  1

    STATION          Q             Dc          DEPTH        HE             AREA       VELOC      INV EL     W.S.EL     ALPHA      [illegible]
VMAIN      VLEFT       VRIGHT      QMAIN       QLEFT      QRIGHT


        Sf=0.000807    Headloss Factor=0.100    Total Headloss=0.028 ft.

  341+60.00     5000.00        5.801        11.708     206.841          969.2      5.159     194.70     206.40     1.059      [illegible]
 4.79   1.05   6.36    3198.06          5.72    1920.43

        Sf=0.000732    Headloss Factor=0.000    Total Headloss=0.026 ft.

  341+95.00     5000.00        5.622        11.749     206.867         1010.0      4.951     194.71     206.46     1.063      [illegible]
 4.59   1.00   6.15    3200.94          5.45    1924.35

        Sf=0.000685    Headloss Factor=0.100    Total Headloss=0.004 ft.

  342+ 0.00     5000.00        5.574        11.760     206.871         1022.9      4.888     194.72     206.48     1.065      [illegible]
 4.45   0.97   5.98    3119.35          5.27    1923.82

        Sf=0.000620    Headloss Factor=0.000    Total Headloss=0.015 ft.

  342+24.00     5000.00        5.353        11.802     206.885         1084.9      4.609     194.73     206.53     1.079      [illegible]
 4.25   0.92   5.87    3073.97          5.01    2125.35

        Sf=0.000645    Headloss Factor=0.100    Total Headloss=0.011 ft.

  342+40.00     5000.00        5.213        11.828     206.896         1126.7      4.438     194.74     206.56     1.087      [illegible]
 4.00   0.86   5.60    2945.06          4.70    2183.06

        Sf=0.000456    Headloss Factor=0.300    Total Headloss=0.033 ft.

  342+80.00     5000.00        4.884        11.891     206.929         1233.9      4.052     194.76     206.65     1.108      [illegible]
 3.68   0.79   5.34    2841.10          4.30    2467.33

        Sf=0.000379    Headloss Factor=0.300    Total Headloss=0.025 ft.

  342+84.00     5000.00        5.078        13.990     206.963         1400.1      3.571     192.76     206.75     1.026      [illegible]
 3.83   0.72   2.81    4606.74          3.92     554.46

        Sf=0.000307    Headloss Factor=0.000    Total Headloss=0.001 ft.

  342+88.00     5000.00        5.440        16.026     206.964         1541.0      3.245     190.76     206.79     1.023      [illegible]
 3.82   0.65   2.77    4637.76          3.53     716.24

        Sf=0.000269    Headloss Factor=0.000    Total Headloss=0.008 ft.

  343+18.00     5000.00        5.440        15.992     206.962         1536.6      3.254     190.80     206.79     1.023      [illegible]
 3.38   0.60   2.59    4323.97          3.30     666.36

        Sf=0.000271    Headloss Factor=0.000    Total Headloss=0.008 ft.

  343+48.00     5000.00        5.440        15.958     206.971         1532.3      3.263     190.84     206.80     1.023      [illegible]
 3.39   0.61   2.60    4325.19          3.31     665.14
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  343+60.00    5000.00      5.440       15.944    206.974        1530.[illegible]  [illegible]        190.[illegible]     [illegible]      [illegible]
 3.66   0.5[illegible]            4[illegible]3.94       3.07     716.72

         Sf [illegible]       Headloss Factor=0.300     Total Headloss=0.031 ft.

  343+70.00    5000.00      5.760       14.216    207.005        1228.7      4.069        192.53     206.74      1.024      [illegible]
 3.62   0.60    2.76    3708.96       3.26      562.43
DATA FILE : A:SUB2STA5                                                                                PAGE :

    STATION         Q           Dc         DEPTH        HE            AREA       VELOC        INV EL     W.S.ELEV    ALPHA      [illegible]
VMAIN     VLEFT       VRIGHT       QMAIN     QLEFT      QRIGHT

         Sf=0.000491     Headloss Factor=0.300     Total Headloss=0.057 ft.

  343+80.00    5000.00      6.125       12.433    207.063         954.5      5.238        194.19     206.63      1.024      [illegible]
 4.54   0.82    3.46    3625.32       4.46      538.43

         Sf=0.001023     Headloss Factor=0.300     Total Headloss=0.121 ft.

  343+90.00    5000.00      6.546       10.520    207.184         703.3      7.110        195.86     206.38      1.024      [illegible]
 5.90   1.18    4.46    3491.84       6.44      498.70

         Sf=0.002676     Headloss Factor=0.300     Total Headloss=0.373 ft.

  344+ 0.00    5000.00      7.034        8.074    207.558         451.0     11.087        197.53     206.80      1.025      [illegible]
 8.17   1.91    6.06    3144.96      10.41      399.85
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                                                                                    PAGE  1

  ''WASP2''SUPERCRITICAL WATER SURFACE PROFILE

                          LLAGAS  CREEK  REACH

COMPUTED BY:  D. HALLSTROM   DATE:   7/26/90   DATA FILE: A:SUP2STAX.5    CHECKED BY:_____________   DATE:________

STATION      Q        B       Z       Dc      DEPTH     AREA     VELOC     E.G.L     INV EL    W.S.EL  SCS FREE  FROUDE  SEQUENT
  ft        cfs      ft               ft       ft       sq ft     fps       ft        ft        ft     BOARD    NUMBER   DEPTH

344+09.20  5000.00  34.00    2.00    7.502    7.502     367.7    13.60    209.43    199.06    206.56    9.38     1.00     7.50

             n=0.0300     So=0.166667    Sf=0.012463    Headloss Factor=0.300   Total Headloss=0.973 ft. Se=0.105565

344+00.00  5000.00  39.61    2.00    6.986    5.204     260.2    19.21    208.46    197.53    202.73    6.51     1.63     9.08

             n=0.0300     So=0.166670    Sf=0.028601    Headloss Factor=0.300   Total Headloss=0.840 ft. Se=0.083694

343+90.00  5000.00  45.71    2.00    6.504    4.186     226.3    22.09    207.63    195.86    200.05    5.23     2.05     9.46

             n=0.0300     So=0.166670    Sf=0.044175    Headloss Factor=0.300   Total Headloss=0.879 ft. Se=0.087301

343+80.00  5000.00  51.80    2.00    6.089    3.523     207.3    24.12    206.75    194.19    197.72    4.52     2.40     9.56

             n=0.0300     So=0.166660    Sf=0.060951    Headloss Factor=0.300   Total Headloss=0.965 ft. Se=0.095684

343+70.00  5000.00  57.90    2.00    5.729    3.046     194.9    25.66    205.80    192.53    195.57    4.05     2.71     9.54

             n=0.0300     So=0.166670    Sf=0.078849    Headloss Factor=0.300   Total Headloss=1.075 ft. Se=0.107129

343+60.00  5000.00  64.00    2.00    5.414    2.687     186.4    26.83    204.73    190.86    193.55    3.69     2.99     9.45
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3A-5

DROP #2 5,000 CFS

Q = 5000 CFS
K = 0.3 (FORM LOSS)
n = 0.03 GROUTED ROCK

```
DATA FILE : A:SUB3STAX.5

          SUBCRITICAL WATER SURFACE PROFILE
           UPSTREAM OF 3A-5 DROP

                 STABILITY-5000 CFS

 COMPUTED BY:      DATE:          CHECKED BY:______________________   DATE:______________

   STATION        Q            Dc          DEPTH      HE           AREA      VELOC       INV EL      W.S.EL     ALPHA      [illegible]
VMAIN    VLEFT       VRIGHT       QMAIN       QLEFT     QRIGHT

   344+ 9.20    5000.00       7.503       7.510     209.434       368.1     13.582      199.06      206.57     1.000      [illegible]
 0.00    0.00    0.00          0.00        0.00       0.00

         Sf=0.007217     Headloss Factor=0.000    Total Headloss=0.029 ft.

   344+13.20    5000.00       7.503       7.849     209.462       390.1     12.818      199.06      206.91     1.000      [illegible]
13.34    0.00    0.00       5204.16        0.00       0.00

         Sf=0.006452     Headloss Factor=0.000    Total Headloss=0.026 ft.

   344+17.20    5000.00       7.503       7.984     209.487       399.0     12.532      199.06      207.05     1.000      [illegible]
12.73    0.00    0.00       5079.25        0.00       0.00

         Sf=0.006107     Headloss Factor=0.000    Total Headloss=0.024 ft.

   344+21.20    5000.00       7.503       8.086     209.511       405.7     12.325      199.07      207.15     1.000      [illegible]
12.47    0.00    0.00       5058.72        0.00       0.00

         Sf=0.005851     Headloss Factor=0.000    Total Headloss=0.023 ft.

   344+25.20    5000.00       7.503       8.170     209.533       411.3     12.157      199.07      207.24     1.000      [illegible]
12.27    0.00    0.00       5048.27        0.00       0.00

         Sf=0.005644     Headloss Factor=0.000    Total Headloss=0.023 ft.

   344+29.20    5000.00       7.503       8.244     209.555       416.2     12.013      199.07      207.31     1.000      [illegible]
12.11    0.00    0.00       5041.78        0.00       0.00

         Sf=0.005445     Headloss Factor=0.100    Total Headloss=0.028 ft.

   344+33.20    5000.00       7.503       8.329     209.582       421.9     11.860      199.07      207.40     1.000      [illegible]
11.96    0.00    0.00       5047.98        0.00       0.00

         Sf=0.005254     Headloss Factor=0.100    Total Headloss=0.026 ft.

   344+37.20    5000.00       7.503       8.403     209.607       426.9     11.712      199.07      207.48     1.000      [illegible]
11.81    0.00    0.00       5041.20        0.00       0.00

         Sf=0.005094     Headloss Factor=0.100    Total Headloss=0.025 ft.
         Sf=[illegible]     Headloss Factor=0.100     Total Headloss=0.0[illegible]4 ft.

   344+45.2           00          7.503          8.528     209.654          435.4                        199.08      [illegible]      1.000       [illegible]
11.56    0.0                5032.62          0.00          0.00

         Sf=0.004834     Headloss Factor=0.100     Total Headloss=0.023 ft.

   344+49.20     5000.00          7.503          8.582     209.675          439.1       11.387       199.08      207.66      1.000       [illegible]
11.45    0.00     0.00      5029.65          0.00          0.00
DATA FILE : A:SUB3STAX.6                                                                                                      PAGE :
   STATION          Q                Dc             DEPTH           HE              AREA        VELOC        INV EL      W.S.EL      ALPHA       E.G. EL
VMAIN     VLEFT          VRIGHT          QMAIN          QLEFT        QRIGHT

         Sf=0.004549     Headloss Factor=0.100     Total Headloss=0.032 ft.

   344+53.20     5000.00          7.453          8.751     209.707          455.2       10.985       199.08      207.83      1.000       [illegible]
11.25    0.00     0.00      5120.39          0.00          0.00

         Sf=0.004164     Headloss Factor=0.100     Total Headloss=0.028 ft.

   344+57.20     5000.00          7.404          8.885     209.734          469.0       10.660       199.08      207.97      1.000       [illegible]
10.87    0.00     0.00      5100.28          0.00          0.00

         Sf=0.003863     Headloss Factor=0.100     Total Headloss=0.025 ft.

   344+61.20     5000.00          7.355          8.998     209.757          481.6       10.382       199.09      208.08      1.000       [illegible]
10.56    0.00     0.00      5087.62          0.00          0.00

         Sf=0.003615     Headloss Factor=0.100     Total Headloss=0.022 ft.

   344+65.20     5000.00          7.307          9.095     209.779          493.2       10.137       199.09      208.18      1.000       [illegible]
10.30    0.00     0.00      5078.62          0.00          0.00

         Sf=0.003952     Headloss Factor=0.100     Total Headloss=0.023 ft.

   344+69.20     5000.00          7.259          9.186     209.801          504.5        9.911       199.09      208.28      1.000       [illegible]
 9.30    0.00     0.00      4689.41          0.00          0.00

         Sf=0.004367     Headloss Factor=0.100     Total Headloss=0.024 ft.

   344+73.20     5000.00          7.212          9.271     209.824          515.5        9.699       199.09      208.36      1.000       210.51
 9.84    0.00     0.00      5070.88          0.00          0.00

         Sf=0.004134     Headloss Factor=0.100     Total Headloss=0.022 ft.

   344+77.20     5000.00          7.166          9.349     209.846          526.0        9.505       199.09      208.44      1.000       [illegible]
 9.63    0.00     0.00      5066.19          0.00          0.00

         Sf=0.003605     Headloss Factor=0.100     Total Headloss=0.020 ft.

   344+81.20     5000.00          7.120          9.417     209.864          536.2        9.324       199.10      208.51      1.001       [illegible]
 9.83    0.00     0.24      5268.74          0.00          0.07

         Sf=0.003368     Headloss Factor=0.100     Total Headloss=0.021 ft.

   344+85.20     5000.00          7.075          9.507     209.884          558.7        8.949       199.10      208.61      1.026       [illegible]
 8.93    1.43     2.09      4885.33          4.02         17.81

         Sf=0.003480     Headloss Factor=0.100     Total Headloss=0.008 ft.

   [illegible]   5000[illegible]                  [illegible]     209.902          550.[illegible]  [illegible]  199.10  [illegible]  [illegible]
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        Sf=0.00[illegible]     Headloss Factor=0.100     Total Headloss=0.007 ft.

   344+88.0[illegible]  [illegible].00        7.044         9.571      209.898          573.3                     199.10      [illegible]    [illegible]
 9.05    2.[illegible]   [illegible]    5022.81       14.95       30.38

        Sf=0.003229     Headloss Factor=0.100     Total Headloss=0.004 ft.

   344+88.50     5000.00        7.039         9.599      209.901          580.7      8.610      199.10      [illegible]    1.044      [illegible]
 8.92    2.46    3.02    4972.22       17.55       48.65
DATA FILE : A:SUB35TAX.5

    STATION          Q             Dc           DEPTH          HE            AREA       VELOC      INV EL      [illegible]    ALPHA      [illegible]
VMAIN      VLEFT       VRIGHT      QMAIN      QLEFT       QRIGHT

        Sf=0.003154     Headloss Factor=0.100     Total Headloss=0.002 ft.

   344+88.80     5000.00        7.036         9.614      209.903          584.6      8.553      199.10      208.71      1.046      [illegible]
 8.85    2.51    3.22    4942.60       18.91       58.88

        Sf=0.003127     Headloss Factor=0.100     Total Headloss=0.001 ft.

   344+89.20     5000.00        7.031         9.616      209.904          584.7      8.562      199.10      208.72      1.046      [illegible]
 8.81    2.53    3.13    4926.50       19.53       54.92

        Sf=0.003025     Headloss Factor=0.100     Total Headloss=0.011 ft.

   344+91.00     5000.00        7.011         9.677      209.913          599.5      8.340      199.10      208.78      1.052      [illegible]
 8.78    3.00    3.66    4962.81       32.20       86.12

        Sf=0.002858     Headloss Factor=0.100     Total Headloss=0.010 ft.

   344+93.20     5000.00        6.987         9.723      209.923          610.8      8.186      199.10      [illegible]    1.054      [illegible]
 8.61    3.24    3.85    4916.31       42.19      103.99

        Sf=0.002637     Headloss Factor=0.100     Total Headloss=0.019 ft.

   344+97.20     5000.00        6.944         9.822      209.941          636.1      7.861      199.10      208.93      1.057      [illegible]
 8.45    3.76    4.39    4906.38       69.84      161.47

        Sf=0.002369     Headloss Factor=0.100     Total Headloss=0.017 ft.

   345+ 1.20     5000.00        6.901         9.911      209.957          660.3      7.572      199.11      209.02      1.056      [illegible]
 8.16    4.03    4.73    4810.07       99.50      221.26

        Sf=0.002139     Headloss Factor=0.100     Total Headloss=0.015 ft.

   345+ 5.20     5000.00        6.869         9.989      209.972          683.7      7.314      199.11      209.10      1.053      [illegible]
 7.90    4.31    4.98    4709.34      131.01      283.57

        Sf=0.001943     Headloss Factor=0.100     Total Headloss=0.014 ft.

   345+ 9.20     5000.00        6.981        10.057      209.984          706.0      7.082      199.11      209.17      1.049      [illegible]
 7.65    4.48    5.16    4605.91      163.81      347.43

        Sf=0.001773     Headloss Factor=0.100     Total Headloss=0.012 ft.

   345+13.20     5000.00        7.097        10.118      209.996          727.7      6.871      199.11      [illegible]    1.045      [illegible]
 7.42    4.60    5.29    4501.44      197.68      412.49

        Sf=0.001625     Headloss Factor=0.100     Total Headloss=0.011 ft.

   345+17.20     5000.00        7.061        10.172      210.007          748.6      6.679      199.11      [illegible]    1.040      [illegible]
 [illegible]
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  345+21.20 [illegible]00     6.976     10.221    210.016        769.1    [illegible]   199.12   [illegible]   [illegible]   [illegible]
 7.00   4.7  [illegible]  4289.73    267.80     544.79

          Sf= [illegible]   Headloss Factor=0.100    Total Headloss=0.009 ft.

  345+25.20    5000.00      6.869     10.264    210.025        788.9     6.338     199.12   209.38   1.031   [illegible]
 6.81   4.79   5.50   4182.79    303.72     611.63
DATA FILE : A:SUB3STAX.5                                                                                   PAGE [illegible]

    STATION         Q            Dc         DEPTH         HE             AREA       VELOC       INV EL     W.S.EL    ALPHA    [illegible]
VMAIN     VLEFT       VRIGHT      QMAIN      QLEFT       QRIGHT


          Sf=0.001277    Headloss Factor=0.100    Total Headloss=0.008 ft.

  345+29.20    5000.00      6.748     10.303    210.033        808.4     6.185     199.12   209.42   1.026   [illegible]
 6.63   4.82   5.53   4076.87    340.19     678.61

          Sf=0.001185    Headloss Factor=0.100    Total Headloss=0.008 ft.

  345+33.20    5000.00      6.617     10.338    210.040        827.4     6.043     199.12   209.46   1.022   [illegible]
 6.45   4.83   5.55   3968.63    377.10     745.90

          Sf=0.001103    Headloss Factor=0.100    Total Headloss=0.007 ft.

  345+37.20    5000.00      6.479     10.370    210.047        846.2     5.909     199.12   209.49   1.018   [illegible]
 6.29   4.84   5.56   3861.18    414.40     813.30

          Sf=0.001028    Headloss Factor=0.100    Total Headloss=0.007 ft.

  345+41.20    5000.00      6.337     10.400    210.053        864.7     5.783     199.13   [illegible]   1.015   [illegible]
 6.13   4.83   5.55   3753.57    452.05     880.76

          Sf=0.000960    Headloss Factor=0.100    Total Headloss=0.006 ft.

  345+45.20    5000.00      6.191     10.426    210.059        882.9     5.663     199.13   209.55   1.013   [illegible]
 5.98   4.82   5.54   3645.89    490.00     948.23

          Sf=0.000899    Headloss Factor=0.100    Total Headloss=0.006 ft.

  345+49.20    5000.00      6.044     10.451    210.064        900.8     5.550     199.13   209.58   1.010   [illegible]
 5.83   4.81   5.52   3538.18    528.21    1015.65

          Sf=0.000635    Headloss Factor=0.100    Total Headloss=0.024 ft.

  345+59.00    5000.00      5.368     10.648    210.087       1131.5     4.419     199.13   209.78   1.005   [illegible]
 5.04   4.80   5.30   3046.89   1050.52    1630.55

          Sf=0.000497    Headloss Factor=0.100    Total Headloss=0.007 ft.

  345+69.20    5000.00      5.443     10.635    210.094       1104.1     4.528     199.14   209.77   1.004   [illegible]
 4.45   4.23   4.68   2587.25    903.89    1444.12

          Sf=0.000537    Headloss Factor=0.100    Total Headloss=0.014 ft.

  345+89.20    5000.00      5.605     10.605    210.109       1049.8     4.763     199.15   209.76   1.004   [illegible]
 4.61   4.36   4.87   2475.08    886.34    1504.03

          Sf=0.000584    Headloss Factor=0.100    Total Headloss=0.008 ft.

  345+99.20    5000.00      5.690     10.589    210.117       1022.5     4.890     199.16   209.74   1.005   [illegible]
 4.79   4.52   5.07   2466.57    895.48    1567.68
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4.97   4.67   [illegible]   2340.31   875.94   1636.09

        Sf [illegible]   Headloss Factor=0.000    Total Headloss=0.010 ft.

  346+33.00    5000.00       6.011       10.620     210.145          929.3      5.380        199.17      [illegible]   1.006    [illegible]
5.22   4.87   5.56   2292.34    878.48    1719.51
DATA FILE : A:SUB3STAX.5                                                                                              PAGE : [illegible]

   STATION          Q             Dc          DEPTH         HE              AREA       VELOC        INV EL       W.S. EL      ALPHA      [illegible]
VMAIN      VLEFT       VRIGHT      QMAIN       QLEFT        QRIGHT

        Sf=0.000740    Headloss Factor=0.100    Total Headloss=0.005 ft.

  346+39.20    5000.00       6.015       10.520     210.160          927.1      5.393        199.18       209.70      1.007    [illegible]
5.34   4.97   5.69   2346.79    882.53    1764.19

        Sf=0.000748    Headloss Factor=0.100    Total Headloss=0.016 ft.

  346+59.20    5000.00       6.028       10.519     210.166          919.6      5.437        199.19       209.70      1.008    [illegible]
5.37   4.95   5.73   2359.43    832.78    1785.98

        Sf=0.000761    Headloss Factor=0.100    Total Headloss=0.016 ft.

  346+79.20    5000.00       6.041       10.517     210.183          912.1      5.482        199.20       209.71      1.008    [illegible]
5.42   4.94   5.78   2379.47    785.14    1813.55

        Sf=0.000775    Headloss Factor=0.100    Total Headloss=0.016 ft.

  346+99.20    5000.00       6.054       10.515     210.199          904.6      5.527        199.21       209.72      1.009    [illegible]
5.46   4.92   5.84   2399.72    736.92    1841.51

        Sf=0.000788    Headloss Factor=0.100    Total Headloss=0.017 ft.

  347+19.20    5000.00       6.068       10.514     210.216          897.2      5.573        199.22       209.73      1.011    [illegible]
5.51   4.89   5.89   2420.17    688.16    1869.82

        Sf=0.000803    Headloss Factor=0.100    Total Headloss=0.017 ft.

  347+39.20    5000.00       6.079       10.507     210.234          889.3      5.623        199.23       209.74      1.012    [illegible]
5.56   4.86   5.95   2438.68    639.01    1898.92

        Sf=0.000817    Headloss Factor=0.100    Total Headloss=0.019 ft.

  347+57.00    5000.00       6.219       10.477     210.252          885.9      5.644        199.24       209.72      1.064    [illegible]
6.53   4.08   5.00   2857.36    533.24    1587.06

        Sf=0.000820    Headloss Factor=0.100    Total Headloss=0.002 ft.

  347+59.20    5000.00       6.212       10.484     210.254          890.9      5.612        199.24       209.72      1.084    [illegible]
6.55   4.12   5.01   2866.62    558.13    1590.06

        Sf=0.000810    Headloss Factor=0.100    Total Headloss=0.014 ft.

  347+72.00    5000.00       6.081       10.527     210.268          890.9      5.612        199.25       209.77      1.01[illegible]    [illegible]
5.59   4.89   5.99   2458.54    645.46    1912.03

        Sf=0.000794    Headloss Factor=0.100    Total Headloss=0.007 ft.

  347+79.20    5000.00       6.064       10.547     210.274          902.1      5.543        199.25       209.79      1.011    [illegible]
5.54   4.92   5.93   2441.92    696.34    1897.33

        Sf=0.000777    Headloss Factor=0.100    Total Headloss=0.016 ft.
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         Sf                  Headloss Factor=0.000     Total Headloss=0.270 ft.

   351+99.20    [illegible]0.00      5.896       10.725      210.569          1013.4      [illegible]       199.46      [illegible]   [illegible]   [illegible]
 5.17    5.06    5.51    2317.65     1239.74     1764.80
DATA FILE : A:SUBSSTAX.5

    STATION          Q              Dc          DEPTH          HE               AREA        VELOC          INV EL      [illegible]   [illegible]   [illegible]
VMAIN      VLEFT        VRIGHT        QMAIN       QLEFT        QRIGHT

         Sf=0.000554     Headloss Factor=0.100     Total Headloss=0.083 ft.

   353+30.00     5000.00        6.219       10.637      210.643           930.3       5.374          199.52      210.16       1.08[illegible]    [illegible]
 6.52    4.40    4.90    2897.96      860.76     1420.78

         Sf=0.000573     Headloss Factor=0.100     Total Headloss=0.063 ft.

   354+20.00     5000.00        6.209       10.544      210.706           840.9       5.946          199.57      210.11       1.08[illegible]    [illegible]
 6.12    4.21    1.75    4068.24      613.08       52.76

         Sf=0.000650     Headloss Factor=0.100     Total Headloss=0.021 ft.

   354+46.00     5000.00        5.986       10.593      210.727           849.1       5.889          199.58      210.17       1.031        [illegible]
 6.10    4.40    1.86    4366.66      588.04       66.22

         Sf=0.000638     Headloss Factor=0.100     Total Headloss=0.010 ft.

   354+60.00     5000.00        5.986       10.608      210.736           862.2       5.799          199.59      210.1[illegible]     1.040        [illegible]
 6.17    3.97    1.86    4680.33      413.14       65.67

         Sf=0.000552     Headloss Factor=0.100     Total Headloss=0.027 ft.

   355+ 0.00     5000.00        5.589       10.663      210.763           901.7       5.545          199.61      210.27       1.036        [illegible]
 5.98    2.40    0.00    6172.89       88.35        0.00

         Sf=0.000475     Headloss Factor=0.100     Total Headloss=0.012 ft.

   355+20.00     5000.00        5.426       10.695      210.775           922.3       5.421          199.62      210.31       1.018        [illegible]
 5.61    1.29    0.00    5104.20       16.14        0.00

         Sf=0.000461     Headloss Factor=0.100     Total Headloss=0.013 ft.

   355+40.00     5000.00        5.274       10.732      210.788           949.7       5.265          199.63      210.36       1.000        [illegible]
 5.22    0.00    0.00    4963.26        0.00        0.00

         Sf=0.000428     Headloss Factor=0.100     Total Headloss=0.023 ft.

   355+80.00     5000.00        4.997       10.797      210.811          1026.9       4.869          199.65      210.44       1.000        [illegible]
 5.09    0.00    0.00    5230.00        0.00        0.00

         Sf=0.000367     Headloss Factor=0.100     Total Headloss=0.015 ft.

   356+10.00     5000.00        4.811       10.834      210.826          1084.0       4.613          199.66      210.49       1.000        [illegible]
 4.76    0.00    0.00    5157.74        0.00        0.00

         Sf=0.000461     Headloss Factor=0.300     Total Headloss=0.008 ft.

   356+20.00     5000.00        4.752       10.848      210.833          1103.2       4.532          199.67      210.51       1.000        [illegible]
 3.82    0.00    0.00    4216.86        0.00        0.00

         Sf=0.000421     Headloss Factor=0.000     Total Headloss=0.003 ft.
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          Sf=0.[illegible]97     Headloss Factor=0.000     Total Headloss=0.009 ft.

   356+60.0     [illegible].00        5.416         14.944      210.846          1403.1                         195.70      [illegible]     1.000      [illegible]
 3.56    0.0[illegible]   [illegible]     4988.94        0.00          0.00
DATA FILE : A:[illegible]UB35TAX.5                                                                                                                  [illegible]

     STATION          Q               Dc            DEPTH          HE             AREA        VELOC          INV EL      [illegible]      ALPHA      [illegible]
VMAIN       VLEFT          VRIGHT        QMAIN        QLEFT        QRIGHT


          Sf=0.000255     Headloss Factor=0.300     Total Headloss=0.011 ft.

   357+ 0.00     5000.00        5.416         14.899      210.857          1397.4        3.578          195.76      [illegible]     1.000      [illegible]
 3.84    0.00     0.00      5370.47        0.00          0.00

          Sf=0.000295     Headloss Factor=0.300     Total Headloss=0.038 ft.

   357+10.00     5000.00        5.719         13.154      210.896          1110.4        4.503          197.43      210.58      1.000      [illegible]
 3.81    0.00     0.00      4232.67        0.00          0.00

          Sf=0.000571     Headloss Factor=0.300     Total Headloss=0.073 ft.

   357+20.00     5000.00        6.064         11.337      210.969           849.0        5.890          199.09      210.43      1.000      [illegible]
 4.83    0.00     0.00      4104.10        0.00          0.00

          Sf=0.001274     Headloss Factor=0.300     Total Headloss=0.169 ft.

   357+30.00     5000.00        6.461          9.319      211.138           605.3        8.260          200.76      210.08      1.000      [illegible]
 6.40    0.00     0.00      3871.32        0.00          0.00
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FILE NAME =  A:SUBSTA5      5,000 CFS   DATA ONLY               PAGE  1
   STATION           FLOW          BMAIN         BLEFT          BRIGHT        INVMAIN        INVLEFT        INVRIGHT
          NMAIN            NLEFT         NRIGHT         ZLEFT          ZRIGHT         ZCLEFT         ZCRIGHT        FORMLOSS


  317+ 9.20        5000.0          30.00         16.00         17.00         193.47         209.50         208.30
          0.030            0.025         0.025          2.000          2.000          2.000          2.000          0.00

  317+49.20        5000.0          30.00         15.47         17.00         193.49         206.07         204.92
          0.030            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  317+69.20        5000.0          33.25         15.20         17.00         193.50         204.35         203.23
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  317+89.20        5000.0          36.50         14.94         17.00         193.51         202.63         201.54
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+ 9.20        5000.0          39.75         14.67         17.00         193.52         200.91         199.85
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+29.20        5000.0          43.00         14.41         17.00         193.53         199.20         198.15
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+49.20        5000.0          46.25         14.14         17.00         193.54         197.48         196.46
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+60.00        5000.0          48.00         14.00         17.00         193.55         196.55         195.55
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+69.20        5000.0          46.50         14.00         17.00         193.55         196.55         195.55
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+89.20        5000.0          43.24         14.00         17.00         193.56         196.56         195.56
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  318+99.20        5000.0          41.61         14.00         17.00         193.57         196.57         195.57
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  319+19.20        5000.0          38.35         14.00         17.23         193.58         196.58         195.58
          0.035            0.025         0.025          2.000          2.000          2.000          2.000          0.10

  319+29.20        5000.0          [illegible]   14.00         17.47         193.59         196.59         195.59
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 STATION           FLOW
                             NLEFT              NRIGHT              ZLEFT              ZRIGHT

319+52.00        5000.0            33.00         14.00         17.62         193.60         196.60         195.60
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

319+59.20        5000.0            33.00         14.00         17.70         193.60         196.60         195.60
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

319+79.20        5000.0            33.00         14.00         17.93         193.61         196.61         195.61
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

319+99.20        5000.0            33.00         15.00         18.17         193.62         196.62         195.62
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

320+19.20        5000.0            33.00         14.80         21.00         193.63         196.63         195.63
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

320+39.20        5000.0            33.00         14.60         22.00         193.64         196.64         195.64
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

320+59.20        5000.0            33.00         15.00         23.00         193.65         196.65         195.65
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.10

320+79.20        5000.0            33.00         16.00         24.00         193.66         196.66         195.66
            0.030         0.025         0.025         2.000         2.000         2.000         2.000            0.10

320+99.20        5000.0            33.00         16.00         24.00         193.67         196.67         195.67
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.00

321+15.00        5000.0            33.00         16.00         24.00         193.68         196.68         195.68
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.00

324+99.20        5000.0            33.00         10.00         24.00         193.87         196.87         195.87
            0.035         0.025         0.025         2.000         2.000         2.000         2.000            0.00

327+49.00        5000.0            33.00         10.00         22.00         193.99         196.99         195.99
            0.035         0.035         0.025         2.000         2.000         2.000         2.000            0.00

328+99.20        5000.0            33.00         10.00         21.00         194.07         197.07         196.07
            0.035         0.035         0.025         2.000         2.000         2.000         2.000            0.00
FILE NAME = A:SUB2STA5                                                  PAGE  3
 STATION           FLOW          BMAIN         BLEFT         BRIGHT        INVMAIN        INVLEFT        INVRIGHT
            NMAIN         NLEFT         NRIGHT        ZLEFT         ZRIGHT         ZCLEFT         ZCRIGHT          FORMLOSS
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          0.035           0.025          0.025          2.000          2.000          2.000          [illegible]         [illegible]

  333+63.0        5000.0           33.00          10.00          21.00         1                197.30         196.30
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.00

  334+80.00       5000.0           33.00          10.00          21.00         194.36         197.36         196.36
          0.035           0.025          0.035          2.000          2.000          2.000          2.000          0.00

  336+99.20       5000.0           33.00          10.00          21.00         194.47         197.47         196.47
          0.035           0.025          0.035          2.000          2.000          2.000          2.000          0.00

  340+ 0.00       5000.0           33.00          10.00          19.00         194.62         197.62         196.62
          0.035           0.025          0.035          2.000          2.000          2.000          2.000          0.00

  340+24.00       5000.0           33.00          10.00          17.00         194.63         197.63         196.46
          0.035           0.025          0.035          2.000          2.000          2.000          2.000          0.10

  340+80.00       5000.0           37.38          10.00          21.00         194.66         202.41         196.09
          0.035           0.025          0.035          2.000          2.000          2.000          2.000          0.10

  341+20.00       5000.0           40.50          10.00          17.00         194.68         205.82         195.83
          0.035           0.025          0.035          2.000          2.000          2.000          2.000          0.10

  341+30.00       5000.0           41.28          10.00          17.00         194.69         206.67         195.76
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.00

  341+60.00       5000.0           43.63          10.00          17.00         194.70         209.24         195.56
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.10

  341+95.00       5000.0           46.36          10.00          17.00         194.71         212.22         195.33
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.00

  342+ 0.00       5000.0           46.75          10.00          17.59         194.72         212.65         195.30
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.10

  342+24.00       5000.0           48.63          10.00          20.41         194.73         214.70         195.14
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.00
 FILE NAME = A:SUBZSTA5                                                      PAGE  4
   STATION        FLOW            BMAIN          BLEFT          BRIGHT        INVMAIN        INVLEFT        INVRIGHT
          NMAIN           NLEFT          NRIGHT         ZLEFT          ZRIGHT         ZCLEFT         ZCRIGHT        FORMLOSS


  342+40.00       5000.0           49.88          10.00          22.29         194.74         214.70         195.04
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.10

  342+80.00       5000.0           53.00          10.00          27.00         194.76         214.70         194.76
          0.035           0.025          0.025          2.000          2.000          2.000          2.000          0.30
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342+88.0     5000.0           64.00        10.00          0.10        1                   214.70        1[illegible].76
       0.035         0.025          0.035         2.000         2.000         2.000         2.000               0.00

343+18.00    5000.0           64.00        10.00          0.10      190.80                214.70        190.80
       0.035         0.025          0.035         2.000         2.000         2.000         2.000               0.00

343+48.00    5000.0           64.00        10.00          0.10      190.84                214.70        190.84
       0.035         0.025          0.035         2.000         2.000         2.000         2.000               0.00

343+60.00    5000.0           64.00        10.00          0.10      190.86                214.70        190.86
       0.030         0.025          0.030         2.000         2.000         2.000         2.000               0.30

343+70.00    5000.0           57.90        10.00          0.10      192.53                214.70        192.53
       0.030         0.025          0.030         2.000         2.000         2.000         2.000               0.30

343+80.00    5000.0           51.80        10.00          0.10      194.19                214.70        194.19
       0.030         0.025          0.030         2.000         2.000         2.000         2.000               0.30

343+90.00    5000.0           45.71        10.00          0.10      195.86                214.70        195.86
       0.030         0.025          0.030         2.000         2.000         2.000         2.000               0.30

344+ 0.00    5000.0           39.61        10.00          0.10      197.53                214.70        197.53
       0.030         0.025          0.030         2.000         2.000         2.000         2.000               0.30

344+ 9.20    5000.0           34.00        10.00          0.10      199.06                214.70        199.06
       0.030         0.025          0.030         2.000         2.000         2.000         2.000               0.30
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5000 CFS   DATA ONLY   UPSTREAM OF REACH 3A-5 DROP

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FILE NAME = A:SUB3STAX.5                                                  PAGE  1
  STATION        FLOW          BMAIN        BLEFT        BRIGHT       INVMAIN      INVLEFT      INVRIGHT
           NMAIN        NLEFT        NRIGHT       ZLEFT        ZRIGHT       ZCLEFT       ZCRIGHT      FORMLOSS

  344+ 9.20      5000.0        34.00        10.00        17.00        199.06       214.70       215.30
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.00

  344+13.20      5000.0        34.00        10.00        17.00        199.06       214.36       214.92
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.00

  344+17.20      5000.0        34.00        10.00        17.00        199.06       214.03       214.54
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.00

  344+21.20      5000.0        34.00        10.00        17.00        199.07       213.69       214.17
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.00

  344+25.20      5000.0        34.00        10.00        17.00        199.07       213.36       213.79
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.00

  344+29.20      5000.0        34.00        10.00        17.00        199.07       213.02       213.41
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.00

  344+33.20      5000.0        34.00        10.00        17.00        199.07       212.69       213.03
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.10

  344+37.20      5000.0        34.00        10.00        17.00        199.07       212.35       212.65
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.10

  344+41.20      5000.0        34.00        10.00        17.00        199.08       212.02       212.28
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.10

  344+45.20      5000.0        34.00        10.00        17.00        199.08       211.68       211.90
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.10

  344+49.20      5000.0        34.00        10.00        17.00        199.08       211.35       211.52
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.10

  344+53.20      5000.0        34.51        10.00        17.00        199.08       211.01       211.14
           0.030        0.025        0.025        2.000        2.000        2.000        2.000        0.10
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   STATION         FLOW           BMAIN         BLEFT         BRIGHT        INV           INVLEFT       INVRIGHT
                          NLEFT          NRIGHT        ZLEFT         ZRIGHT          LEFT          ZCRIGHT       FORMLOSS

  344+61.20       5000.0          35.53         10.00         17.00         199.09        210.34        210.39
               0.030      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+65.20       5000.0          36.04         10.00         17.00         199.09        210.01        210.01
               0.030      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+69.20       5000.0          36.55         10.00         17.00         199.09        209.67        209.63
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+73.20       5000.0          37.06         10.00         17.00         199.09        209.34        209.25
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+77.20       5000.0          37.57         10.00         17.00         199.09        209.00        208.87
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+81.20       5000.0          38.08         10.00         17.00         199.10        208.67        208.50
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+85.20       5000.0          38.59         10.00         17.00         199.10        208.33        208.12
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+87.20       5000.0          38.85         10.00         17.00         199.10        208.15        208.44
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+88.00       5000.0          38.95         10.00         17.00         199.10        208.07        208.00
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+88.50       5000.0          39.01         10.00         17.00         199.10        208.03        207.80
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+88.80       5000.0          39.05         10.00         17.00         199.10        208.01        207.70
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+89.20       5000.0          39.10         10.00         17.00         199.10        208.00        207.74
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10

  344+91.00       5000.0          39.33         10.00         17.00         199.10        207.80        207.49
               0.035      0.025         0.025         2.000         2.000         2.000         2.000         0.10
 FILE NAME =   A:SUB3STAX.5                                                   PAGE  3

   STATION         FLOW           BMAIN         BLEFT         BRIGHT        INVMAIN       INVLEFT       INVRIGHT
               NMAIN      NLEFT         NRIGHT        ZLEFT         ZRIGHT        ZCLEFT        ZCRIGHT       FORMLOSS
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          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 344+97.2        5000.0          40.12           10.00           17.00           1               207.33          206.98
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+ 1.20       5000.0          40.63           10.00           17.00           199.11          206.99          206.61
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+ 5.20       5000.0          41.14           10.00           17.00           199.11          206.66          206.23
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+ 9.20       5000.0          41.65           10.00           17.00           199.11          206.32          205.85
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+13.20       5000.0          42.16           10.00           17.00           199.11          205.98          205.47
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+17.20       5000.0          42.67           10.00           17.00           199.11          205.65          205.09
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+21.20       5000.0          43.18           10.00           17.00           199.12          205.31          204.72
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+25.20       5000.0          43.69           10.00           17.00           199.12          204.98          204.34
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+29.20       5000.0          44.20           10.00           17.00           199.12          204.64          203.96
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+33.20       5000.0          44.71           10.00           17.00           199.12          204.31          203.58
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+37.20       5000.0          45.22           10.00           17.00           199.12          203.97          203.20
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+41.20       5000.0          45.73           10.00           17.00           199.13          203.64          202.83
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
FILE NAME = A:SUBSSTAX.5                                                     PAGE  4
   STATION         FLOW            BMAIN           BLEFT           BRIGHT          INVMAIN         INVLEFT         INVRIGHT
          NMAIN           NLEFT           NRIGHT          ZLEFT           ZRIGHT          ZCLEFT          ZCRIGHT         FORMLOSS

 345+45.20       5000.0          46.24           10.00           17.00           199.13          203.30          202.45
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+49.20       5000.0          46.75           10.00           17.00           199.13          202.97          202.07
          0.035           0.025           0.025           2.000           2.000           2.000           2.000           0.10
 345+69.2       5000.0           45.93        20.38       27.11                      202.15     201.15
            [illegible]35   0.025          0.025       2.000       2.000        2.000       2.000        0.10

 345+89.20      5000.0           41.88        19.16       27.34        199.16       202.16     201.16
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 345+99.20      5000.0           39.85        18.55       27.45        199.16       202.16     201.16
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 346+19.20      5000.0           35.80        17.33       27.67        199.16       202.17     201.17
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 346+33.00      5000.0           33.00        16.48       27.62        199.17       202.18     201.18
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.00

 346+39.20      5000.0           33.00        16.10       27.89        199.18       202.18     201.18
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 346+59.20      5000.0           33.00        14.88       28.11        199.19       202.19     201.19
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 346+79.20      5000.0           33.00        13.66       28.33        199.20       202.20     201.20
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 346+99.20      5000.0           33.00        12.44       28.56        199.21       202.21     201.21
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 347+19.20      5000.0           33.00        11.22       28.78        199.22       202.22     201.22
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10
FILE NAME =  A:SUB3STAX.5                                               PAGE  5

  STATION         FLOW          BMAIN        BLEFT        BRIGHT      INVMAIN      INVLEFT     INVRIGHT
           NMAIN        NLEFT         NRIGHT       ZLEFT       ZRIGHT       ZCLEFT      ZCRIGHT      FORMLOSS


 347+39.20      5000.0           33.00        10.00       29.00        199.23       202.23     201.23
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10

 347+57.00      5000.0           33.00        10.00       29.00        199.24       202.24     201.24
           0.030        0.030          0.030       2.000       2.000        2.000       2.000        0.10

 347+59.20      5000.0           33.00        10.61       28.96        199.24       202.24     201.24
           0.030        0.030          0.030       2.000       2.000        2.000       2.000        0.10

 347+72.00      5000.0           33.00        10.00       28.93        199.25       202.25     201.25
           0.035        0.025          0.025       2.000       2.000        2.000       2.000        0.10
 347+99.2        5000.0          33.00       11.83        28.87        [illegible]      202.26      201.26
         0.035          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 351+99.20        5000.0          33.00       24.00        28.00        199.46       202.46      201.46
         0.035          0.025         0.025         2.000        2.000         2.000       2.000          0.00

 353+30.00        5000.0          33.00       13.00        25.00        199.52       202.53      201.53
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 354+20.00        5000.0          47.59       11.79        18.79        199.57       202.57      208.62
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 354+46.00        5000.0          51.80       10.00        17.00        199.58       202.58      210.67
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 354+60.00        5000.0          54.07       10.00        17.00        199.59       203.83      211.77
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 355+ 0.00        5000.0          60.55       10.00        17.00        199.61       207.40      214.93
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 355+20.00        5000.0          63.79       10.00        17.00        199.62       209.19      216.50
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10
FILE NAME =   A:SUB3STAX.6                                                     PAGE  6

   STATION          FLOW           BMAIN        BLEFT       BRIGHT       INVMAIN       INVLEFT      INVRIGHT
         NMAIN          NLEFT         NRIGHT        ZLEFT        ZRIGHT        ZCLEFT      ZCRIGHT        FORMLOSS


 355+40.00        5000.0          67.03       10.00        17.00        199.63       210.97      216.50
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 355+80.00        5000.0          73.52       10.00        17.00        199.65       214.55      216.51
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 356+10.00        5000.0          78.38       10.00        17.00        199.66       217.50      216.51
         0.025          0.025         0.025         2.000        2.000         2.000       2.000          0.10

 356+20.00        5000.0          80.00       10.00        17.00        199.67       217.50      216.51
         0.035          0.025         0.025         2.000        2.000         2.000       2.000          0.30

 356+28.00        5000.0          64.00       10.00        17.00        195.66       217.50      216.51
         0.035          0.025         0.025         2.000        2.000         2.000       2.000          0.00

 356+60.00        5000.0          64.00       10.00        17.00        195.70       217.51      216.51
         0.035          0.025         0.025         2.000        2.000         2.000       2.000          0.00
```

```
          0.030       0.025       0.025       2.000       2.000       2.000       2.000       0.30

357+10.0       000.0           68.11       10.00       17.00       1              217.51      216.52
          [illegible]  0.025       0.025       2.000       2.000       2.000       2.000       0.30

357+20.00      5000.0          52.21       10.00       17.00      199.09          217.51      216.52
          0.030       0.025       0.025       2.000       2.000       2.000       2.000       0.30

357+30.00      5000.0          46.32       10.00       17.00      200.76          217.51      216.52
          0.030       0.025       0.025       2.000       2.000       2.000       2.000       0.30

357+40.00      5000.0          40.42       10.00       17.00      202.43          217.51      216.52
          0.030       0.025       0.025       2.000       2.000       2.000       2.000       0.30

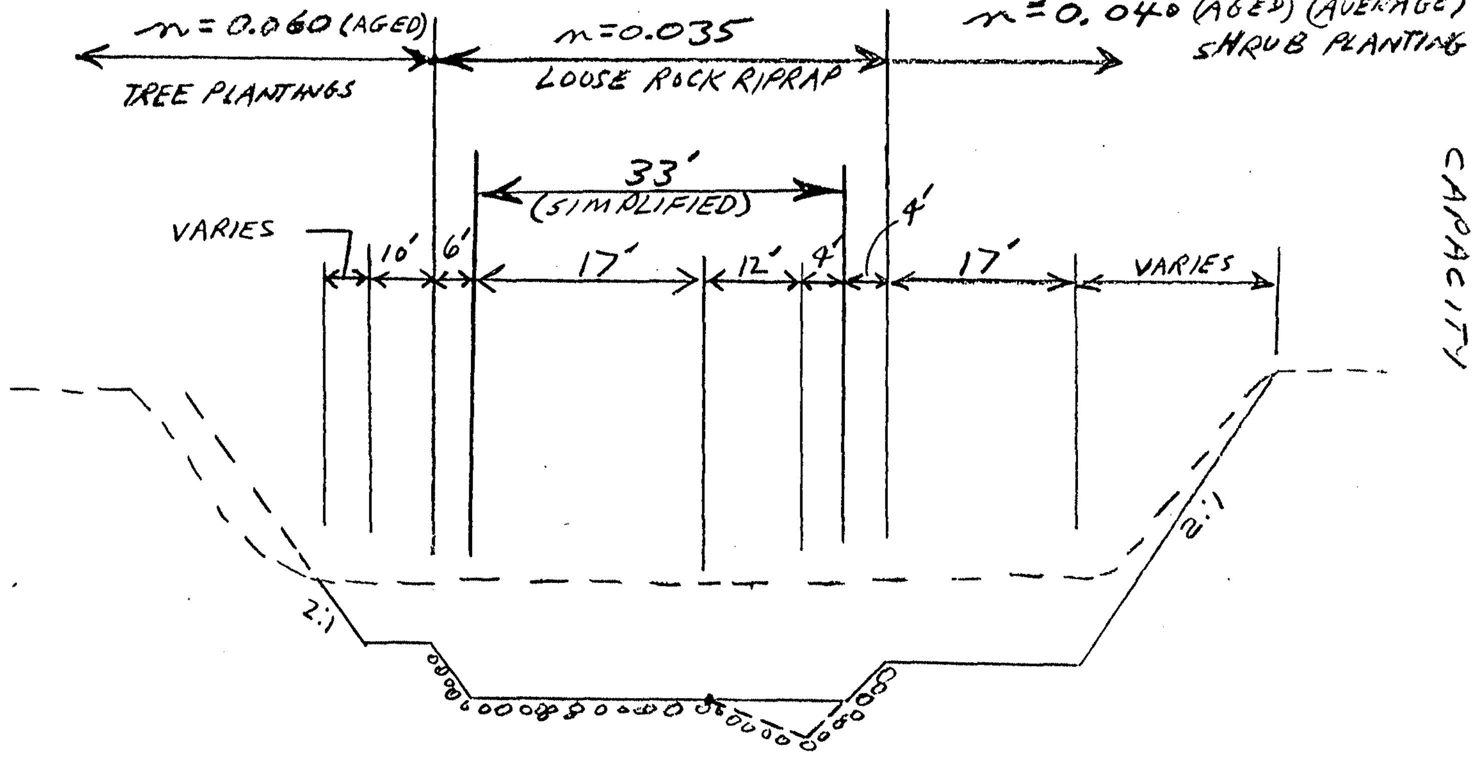
357+49.20      5000.0          35.00       10.00       17.00      203.96          217.51      216.52
          0.030       0.025       0.025       2.000       2.000       2.000       2.000       0.30
```

5. HYDRAULIC DESIGN PARAMETES

CA. LLAGAS CREEK REACH 3A-5

DRH 6-21-91

HYDRAULIC SECTION AND "N" VALUES FOR CAPACITY



SIMPLIFIED SECTION FOR W.S.P.

LOOKING UPSTREAM

BENCH WIDTHS ARE INCREASED WHERE APPROPRIATE TO ACCOUNT FOR EXISTING CHANNEL WIDTHS GREATER THAN PLANNED SECTION

COMPUTATION SHEET
SCS–ENG–522 REV. 3–69

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE California
PROJECT Lower Llagas Creek
BY D.Twiss DATE 9/14/83
CHECKED BY DRH DATE 5-2-89
JOB NO. Reach 3
SUBJECT Hydraulics (Manning's "n")
SHEET 1 OF 3

STABILITY

NEH-5
Supplement
"B"

Given:
As Built channel – Earth – FOR STABILITY CHECK

Character of Channel

Basic n	= 0.020	Earth
Irregularity	= 0.000	Smooth
Size & Shape	= 0.000	gradually
Obstructions	= 0.000	non
Vegetation	= 0.005	Low
Meander	= 0.000	minor

n_s = Total = 0.025 ok
same as in NHCP
open Channels

USE 0.025 FOR
LEFT, CENTER, AND RIGHT
PORTIONS OF OVERBANK

EDS-FWS
Pg 6-2

Given: Loose Rock Riprap

$n_s = 0.035$

Given: Grouted Rock Riprap

$n_s = 0.030$

COMPUTATION SHEET
SCS-ENG-522 REV. 3-69

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GPO 1964-O-337-998

STATE California
PROJECT Lower Llagas Creek
BY D. Twiss DATE 9/14/83
CHECKED BY DRA
DATE
JOB NO. Reach 3
SUBJECT Hydraulics (Mannings' 'n')
SHEET 2 OF 3

NEH-5
Supl. B

Given: Aged Main Channel

Character of Channel

Basic 'n' = 0.020 Earth
Irregularity = 0.000
Size and Shape = 0.000
Obstructions = 0.000
Vegetation = 0.010
Meander = 0.000 +

Total = 0.030

Given: Aged Left Overbank

Character of Channel

Basic 'n' = 0.020
Irregularity = 0.000
Size and Shape = 0.000
Obstructions = 0.000
Vegetation = 0.040 PROPOSED LANDSCAPING
Meander = 0.000 +

Total = 0.060

CA. LLAGAS REACH 3

DRH 6-29-89

MANNINGS "N" 3 3

(REF.: NEHS SUP. B)

GIVEN: AGED RIGHT OVERBANK

CHARACTER OF CHANNEL

BASIC "n"	0.020
IRREGULARITY	0.000
SIZE AND SHAPE	0.000
OBSTRUCTIONS	0.000
VEGETATION	0.020
MEANDER	0.000 +
TOTAL =	0.040

6. HYDRAULIC COMPUTATIONS

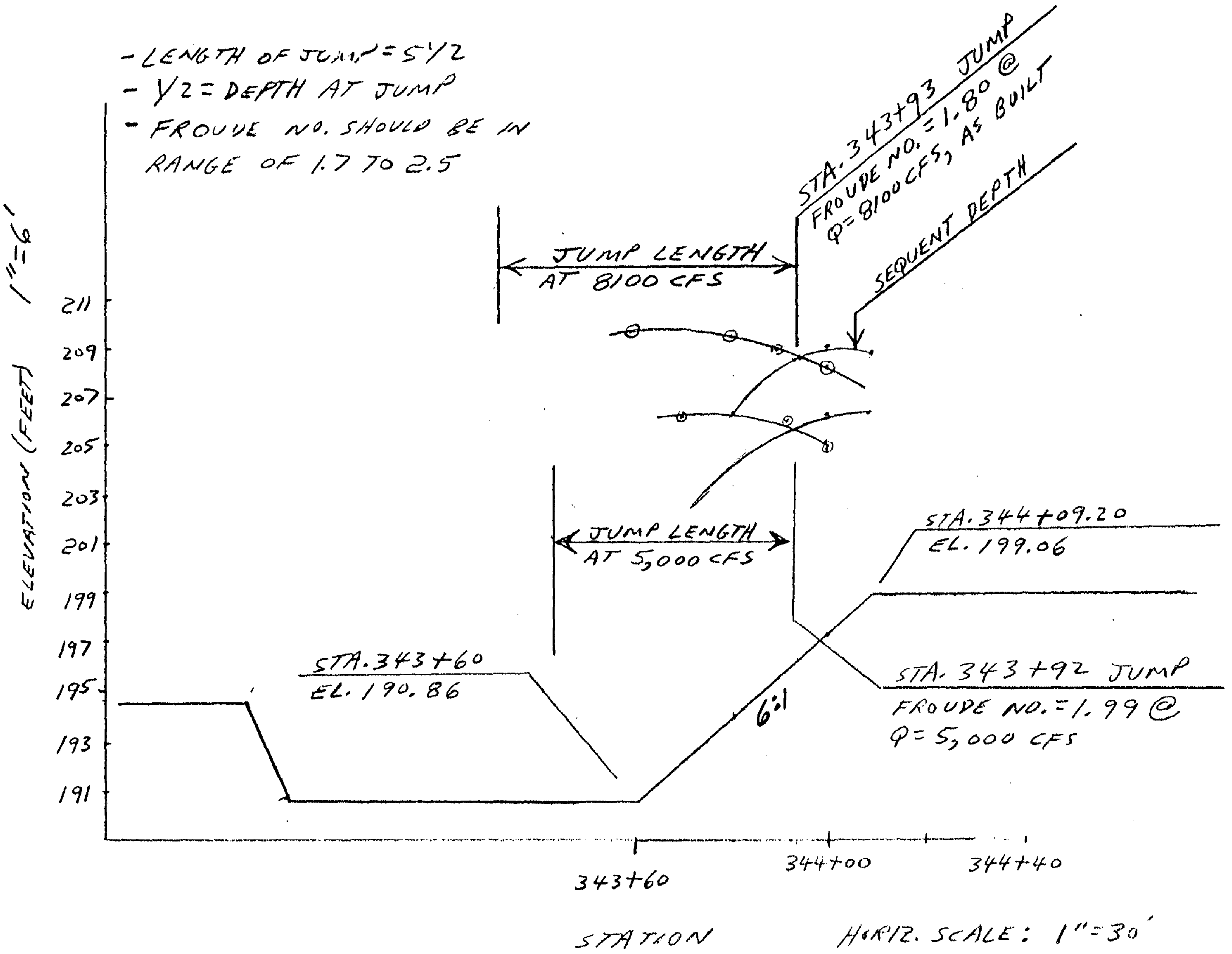
CALIF.

DRH 7-30-91

LLAGAS CREEK REACH 3A-5

PLOT OF HYDRAULIC JUMP AT DROP (PREVIOUSLY #2)

- LENGTH OF JUMP = 5Y2
- Y2 = DEPTH AT JUMP
- FROUDE NO. SHOULD BE IN RANGE OF 1.7 TO 2.5



HORIZ. SCALE: 1" = 30'

7. CHANNEL STABILITY

CHANNEL EVALUATION PROCEDURAL GUIDE

APPLICABLE RESPONSES HAVE BEEN CIRCLED

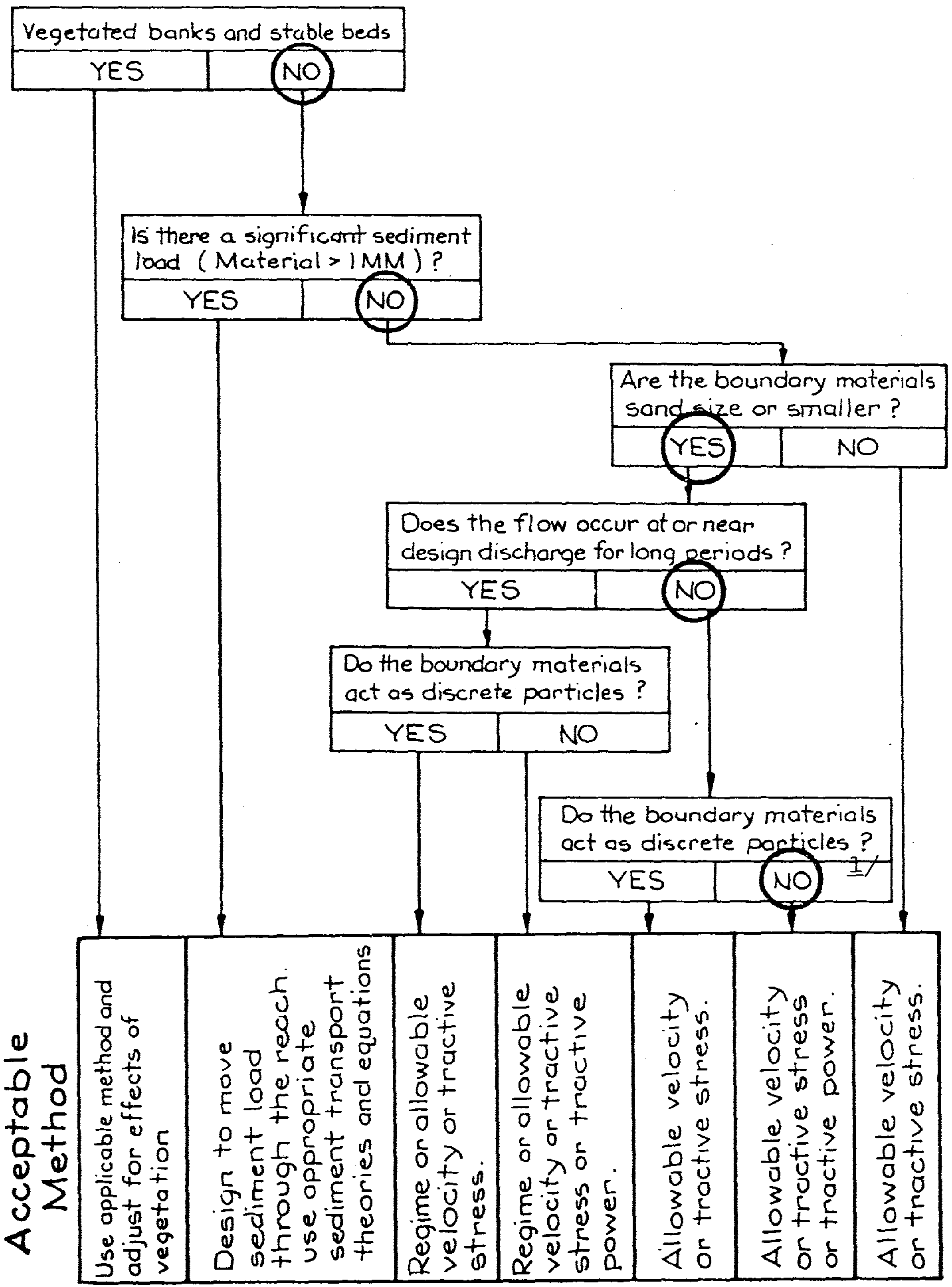

Vegetated banks and stable beds
YES [✓ NO]
Is there a significant sediment load (Material > 1MM)?
YES [✓ NO]
Are the boundary materials sand size or smaller?
[✓ YES] NO
Does the flow occur at or near design discharge for long periods?
YES [✓ NO]
Do the boundary materials act as discrete particles?
YES NO
Do the boundary materials act as discrete particles? 1/
YES [✓ NO]
Acceptable Method
Use applicable method and adjust for effects of vegetation
Design to move sediment load through the reach. use appropriate sediment transport theories and equations
Regime or allowable velocity or tractive stress.
Regime or allowable velocity or tractive stress or tractive power.
Allowable velocity or tractive stress.
Allowable velocity or tractive stress or tractive power.
Allowable velocity or tractive stress.

Figure 6-1

i.e. is...

1/ D_{75} is > 6.3mm. for all samples ? (no)

SCS-344a 5-57
Tabular Computations

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DATA SHEET FOR CHANSTAB PROGRAM

CHANNEL STABILITY

PROJECT : LLAGAS CREEK REACHES 3A-4/5/6

BY: DRH DATE: 3/90 CHECKED:

* = DEFAULT VALUES IF APPLICABLE

	STA.	DRILL HOLE	SOIL	Q CFS	BOTTOM WIDTH b	z SIDESLOPE	"n" MANNINGS	d FT. FLOW DEPTH	V FPS 2/ VELOCITY	Rc RADIUS OF CURVE	Lc DIST. D/S FROM B.C.	qu (PSF) UNCON. COMP. STRENGTH	Se ENERGY SLOPE	d75 mm	d65 mm	d50 mm	t F°	SED. LOAD PPM	ANGULARITY NON-COHESIVE ONLY
S/H	297+00	19.3	SC CL	8100	33	2	.025	12.98	9.0	∞	—	1200	.0008	0.15	.10	.07	50	0	—
S/H	1/ → 297+00	19.3	"	"	"	"	"	"	"	"	"	"	"	"	.10	.10	50	0	
H	293+00	19.3	"	8100	33	2	.025	12.7	8.2	∞	—	1200	.0009	0.15	.10	.10	50	0	—
S/H	301+00	20.1	CL	8100	33	2	.025	13.2	6.5	1000	50	1400	0.0007	.06	.03	.01	50	0	—
S/H	1/ → 301+00	"	"	"	"	"	"	"	"	"	"	"	"	"	.1	.1	50	0	
H	305+00	20.1	CL	8100	33	2	.025	13.4	7.4	∞	—	1400	.001	.15	.1	.1	50	0	—
S/H	354+65	23.3	SC	8100	54	2	.025	12.9	6.6	850	50	1200	.0013	2.1	1.5	.60	50	0	—
															—	—			
S/H	375+60	32.2	SC CL	8100	33	2	.025	13.3	6.9	350	50	1200	.0011	.60	.28	.07	50	0	—
	1/ → 375+60	"	"	"	"	"	"	"	"	"	"	"	"	"	.1	.1	50	0	—

S = SOIL SITE STA.
H = HYD. SITE STA.

1/ IF $D_{75} < 6.3$ mm AND $D_{50} < 0.1$ mm, USE $D_{50} = 0.1$ mm AND $D_{65} = 0.1$ mm (DEFAULT VALUES)

2/ USE V_{MEAN} VALUE FROM WATER SURFACE PROFILES

DEFINITIONS FOR "CHANSTAB" PROGRAM

5. ENTER THE SOIL SAMPLE NUMBER:

6. ENTER THE CROSS SECTION STATION:
   Items 2 to 6 may be left blank by pressing the return, item 1 must be inputed each time the program is excuted.

7. ENTER Q: flow in feet per second

8. ENTER b: bottom width in feet

9. ENTER z: side slope

10. ENTER n: Mannings friction factor

11. ENTER d: depth of flow in feet

12. ENTER v: velocity in feet per second

13. ENTER Rc: radius of curve in feet

14. ENTER Lc: length downstream from the tangent of the curve in feet

15. ENTER qu: unconfined compressive strength in pounds per square foot
    ITEMS 13 TO 15 PRESS RETURN IF NOT APPLICABLE

16. ENTER Se: slope of the energy grade line in feet per foot

17. ENTER d75: grain size where 75 per cent of the sample is finer in mm

18. ENTER d65: grain size where 65 per cent of the sample is finer in mm

19. ENTER d50: grain size where 50 per cent of the sample is finer in mm

20. ENTER tWATER: temperature of the water in degrees F
    PLEASE RETURN TO ENTER TEMPERATURE OF 60 DEGREES

21. ENTER SedLoad: sediment load of the water in ppm

22. ENTER Angularity: enter the number of the selected descriptive term from the menu

ITEMS 21 AND 22 PRESS RETURN IF NOT APPLICABLE

OPERATIONS DURING INPUT AND EDIT ROUTINES

Once the data has been entered the program automatically proceeds to the edit routine. Program asks if you want to review the data. If the answer is no, the program processes the data in the set. If the answer is yes, the program displays the input data in menu form. The program will ask that you select a menu number and make the necessary change. It will then ask if you wish to review the angularity input. If the answer is no, the data will be processed.

```
N

PROJECT: LLAGAS CREEK REACH 3A-4/5/6
STATION: 29700
SAMPLE NO.: 19.3
BY: D. HALLSTROM
DATE: 3/22/90
SET NUMBER          1

 Q(cfs)     b(ft)    z        n       d(ft)     v(fps)
 ------     -----    -        -       -----     ------
 8100.      33.0    2.0      .025     13.0      9.00

 Rc(ft)     Lc(ft)     qu*      Se
 -----      -----     -----     --
    .0         .0     1200.0   .0008

d75(mm)   d65(mm)   d50(mm)  tWATER      SEDLOAD
------    -------   ------   ------      -------
  .150     .100      .100      50.            .0

   ANGULARITY
   ----------
Not applicable
```

qu = UNCONFINED COMP. STRENGTH

```
Press "Return" to continue



   Tref    Tb       Ts      Ta      VTb     VTs
   ----    ---      ---     ---     ---     ---
   .170    .242     .199   2.917   2.177   1.795


 VTb (bottom)    IS STABLE
 VTs (side)      IS STABLE
```

VTb AND VTs PLOT TOO CLOSE TO "S" LINE *
CONSIDER BOTH AS UNSTABLE
ADD ROCK RIPRAP

* FIG. 6-15, TR-25

```
Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: LLAGAS CREEK REACH 3A-4/5/6
STATION: 29300
SAMPLE NO.:
BY: d. hallstrom
DATE: 3/22/90
SET NUMBER 2

 Q(cfs)      b(ft)    z          n        d(ft)      v(fps)
 ------      -----    -          -        -----      ------
 8100.        33.0    2.0      .025       12.7        8.20

 Rc(ft)    Lc(ft)      qu          Se
 -----     -----      -----        --
    .0        .0     1200.0     .0009

d75(mm)   d65(mm)   d50(mm)  tWATER       SEDLOAD
-------   -------   -------  -------      -------
  .150     .100      .100       50.             .0

   ANGULARITY
   ----------
Not applicable

Press "Return" to continue


d75(mm)   d65(mm)   d50(mm)  tWATER       SEDLOAD
-------   -------   -------  -------      -------
  .150     .100      .100       50.             .0

   ANGULARITY
   ----------
Not applicable

Press "Return" to continue


   Tref     Tb        Ts       Ta        VTb       VTs
   ----     ---       ---      ---       ---       ---
  .148     .210      .173    2.917     1.722     1.417

 VTb (bottom)    IS STABLE ] BOTH PLOT TOO CLOSE TO
 VTs (side)      IS STABLE ] "S" LINE. CONSIDER AS UNSTABLE
                              ADD ROCK RIPRAP

Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: llagas creek reach 3a-4/5/6
STATION: 30100
SAMPLE NO.: 20.1
BY: d. hallstrom
DATE: 3/22/90
SET NUMBER 3

 Q(cfs)      b(ft)     z          n         d(ft)      v(fps)
 ------      -----     -          -         -----      ------
 8100.       33.0     2.0        .025       13.2       6.50
                            *
 Rc(ft)     Lc(ft)      qu          Se
 -----      -----      -----        --
1000.0       50.0     1400.0     .0007

d75(mm)    d65(mm)    d50(mm)   tWATER       SEDLOAD
------     -------    ------    ------       -------
  .060      .100       .100       50.              .0

    ANGULARITY          * qu = UNCONFINED
    ----------                 COMP.
Not applicable                 STRENGTH

Press "Return" to continue


    Tref       Tb          Ts        Ta - allowable
    ----       ---         ---       ---
    .097      .138        .114     4.296

     Tbc       Tbt         Tsc       Tst       VTb
     ---       ---         ---       ---       ---
    .145      .145        .120      .120      .899

    VTbc      VTbt         VTs      VTsc      VTst
    ----      ----         ----     ----      ----
    .944      .944        .742      .779      .779


 VTb (bottom straight section)     IS STABLE
 VTs (side straight section)       IS STABLE
 VTbc (bottom in curve)            IS STABLE<- WORST CASE
 VTbt (bottom at curve tangent)    IS STABLE   PLOTS SAFE
 VTsc (side in curve)              IS STABLE   DISTANCE FROM
 VTst (side at curve tangent)      IS STABLE   "S" LINE
                                             HOWEVER, ADD ROCK TO CHANNEL BOTTOM
                                             SINCE VTb IS HIGHEST AND VEL. IS HIGH

)o you want the results from this set sent to a
'ile to be sent to the printer (y or n)?
```

```
STATION: 35465
SAMPLE NO.: 23.3
BY: d. hallstrom
DATE: 4/10/90
SET NUMBER 5        4

 Q(cfs)     b(ft)    z         n        d(ft)      v(fps)
 ------     -----    -         -        -----      ------
 8100.      54.0    2.0      .025       12.9        6.60

 Rc(ft)    Lc(ft)     qu        Se
 -----     -----     -----      --
 850.0      50.0     1200.0    .0013

d75(mm)   d65(mm)   d50(mm)  tWATER     SEDLOAD
------    -------   ------   ------     -------
 2.100     1.500     .600      50.           .0

   ANGULARITY
   ----------
Not applicable

Press "Return" to continue


   Tref       Tb          Ts       Ta - allowable
   ----       ---         ---      ---
   .182      .250        .196    2.917

    Tbc       Tbt         Tsc      Tst      VTb
    ---       ---         ---      ---      ---
   .263      .263        .206     .206    1.651

   VTbc      VTbt         VTs     VTsc     VTst
   ----      ----         ----    ----     ----
  1.734     1.734        1.293   1.357    1.357


 VTb (bottom straight section)      IS STABLE
 VTs (side straight section)        IS STABLE
 VTbc (bottom in curve)             IS STABLE
 VTbt (bottom at curve tangent)     IS STABLE
 VTsc (side in curve)               IS STABLE
 VTst (side at curve tangent)       IS STABLE


Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

HOWEVER, ADD ROCK
TO CHANNEL BOTTOM —
SINCE VTb IS HIGHEST
AND VEL. IS HIGH.

```
STATION: 37560
SAMPLE NO.: 32.2
BY: d. hallstrom
DATE: 4/10/90
SET NUMBER 6

 Q(cfs)      b(ft)     z          n        d(ft)      v(fps)
 ------      -----     -          -        -----      ------
 8100.       38.0     2.0       .025      13.3        6.90

 Rc(ft)     Lc(ft)     qu         Se
 -----      -----     -----       --
 350.0       50.0     1200.0    .0011

d75(mm)   d65(mm)    d50(mm)  tWATER      SEDLOAD
------    -------    ------   ------      -------
  .600     .100       .100      50.             .0

   ANGULARITY
   ----------
Not applicable

Press "Return" to continue


   Tref       Tb          Ts       Ta - allowable
   ----       ---         ---      ---
   .114      .162        .132    2.917

    Tbc       Tbt         Tsc       Tst      VTb
    ---       ---         ---       ---      ---
   .177      .177        .144      .144    1.115

   VTbc      VTbt        VTs      VTsc      VTst
   ----      ----        ----     ----      ----
  1.223     1.223        .908      .997      .997


 VTb (bottom straight section)     IS STABLE
 VTs (side straight section)       IS STABLE
 VTbc (bottom in curve)            IS STABLE
 VTbt (bottom at curve tangent)    IS STABLE
 VTsc (side in curve)              IS STABLE
 VTst (side at curve tangent)      IS STABLE

Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

HOWEVER, ADD ROCK TO CHANNEL BOTTOM SINCE VTb IS HIGHEST AND VEL IS HIGH.

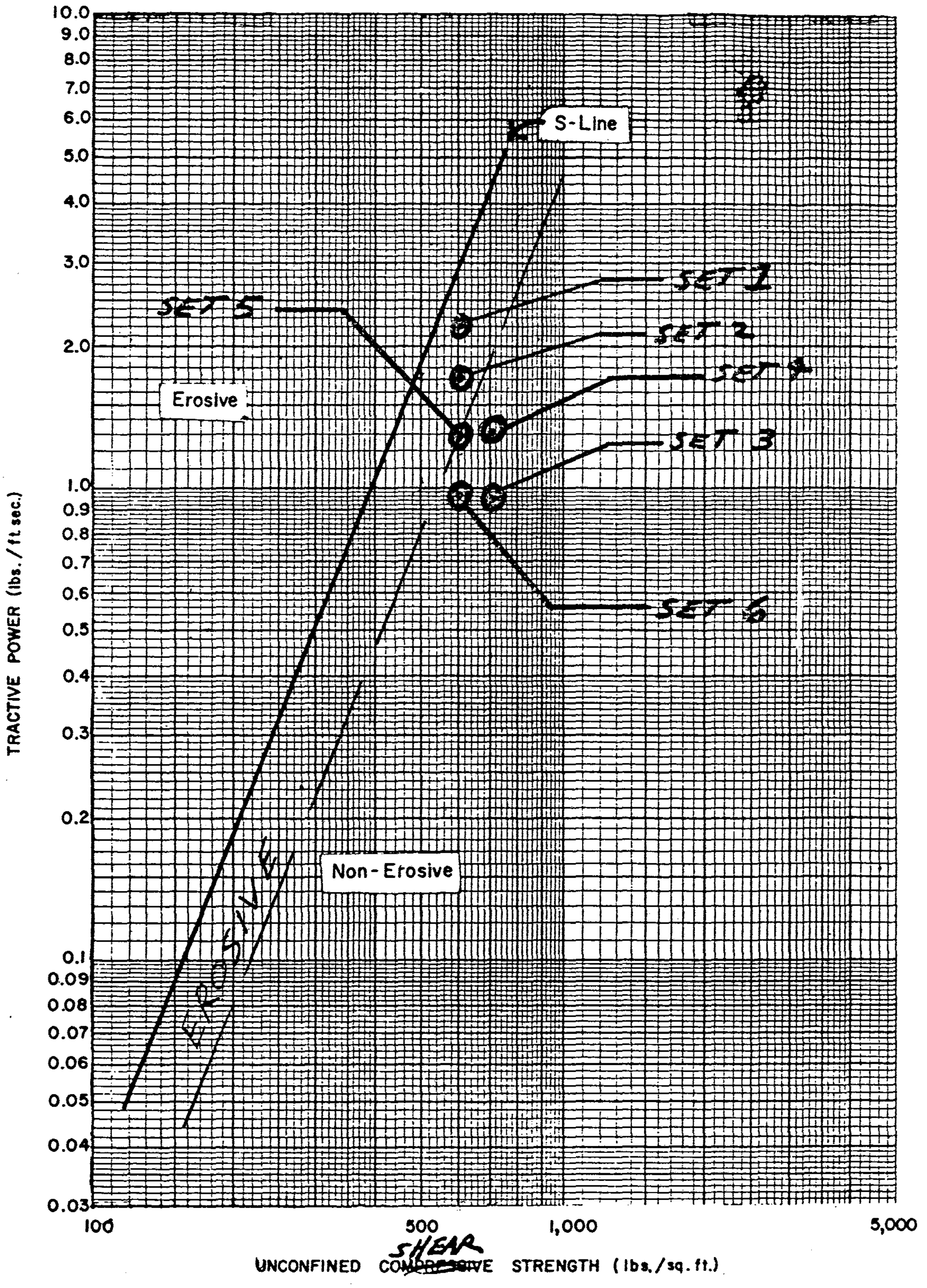


Figure 6-15
Unconfined ~~Compressive~~ SHEAR Strength And Tractive Power As Related To Channel Stability

UNCONFINED SHEAR STRENGTH = 1/2 OF
UNCONFINED COMPRESSIVE STRENGTH

SOIL GROUP SUMMARY 2

Field Sample No.	Depth (ft.)	Natural Moisture (% of dry wt.)	Dry Density (lbs./cu.ft.)	GRAIN SIZE ANALYSIS															ATTERBERG LIMITS			Specific Gravity	Maximum Density (lbs./cu. ft.)	Optimum Moisture (% of dry wt.)	Soil Group Symbol
				%Passing U.S. Standard Sieve Sizes										% Finer Micron Size											
				1-1/2	3/4	3/8	#4	#10	#20	#40	#60	#140	#200	.75	50	20	5	2	Liquid Limit	Plastic Limit	Plasticity Index				
23.3	15'-16'	—	—	—	—	100	89	72	56	45	38	30	28	28	26	22	17	15	34	18	16	2.82	—	—	SC
10A.1	7'- 8.5'	19	108.1	100	97	84	75	56	45	42	39	32	30	30	27	22	17	14	36	16	20	2.80	—	—	SC
6A.1	8'- 8.8'	—	--	100	79	75	71	64	57	49	42	35	32	32	31	24	18	16	33	15	18	2.69	--	--	SC
6.2	10'-26'	—	--	100	97	79	66	57	51	46	42	35	33	33	30	26	19	15	35	12	23	2.77	—	--	SC

UNIFIED SOIL CLASSIFICATION SC

RANGE OF PROPERTIES

% Passing #200 Sieve	28-33%
Liquid Limit	33-36
Plasticity Index	16-23

GENERAL DESCRIPTION AND BEHAVIOR

These soils are gravelly clayey sands. The fines act predominately like clay soils. Shear strength is very good with a high Ø angle and moderate cohesion. Permeabilities are low to practically impervious depending on in-place density, and percent of fines. Workability is good and these soils should provide an excellent earth fill when compacted.

RANGE OF DESIGN VALUES

Unconfined Compressive Strength	1000-1500 psf
Triaxial Shear Strength	(estimated)

UNCONF. SHEAR
STRENGTH = 500 – 700[illegible]

Ø	C
25°	200 psf (Total Stress)
30°	50 psf (Effective Stress)

Permeability K=10^{-3} to 10^{-5} fpd.

SOIL GROUP SUMMARY 3

Field Sample No.	Depth (ft.)	Natural Moisture (% of dry wt.)	Dry Density (lbs./cu.ft.)	GRAIN SIZE ANALYSIS % Passing U.S. Standard Sieve Sizes 1-1/2	3/4	3/8	#4	#10	#20	#40	#80	#140	#200	% Finer Micron Size .75	50	20	5	2	ATTERBERG LIMITS Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Maximum Density (lbs./cu. ft.)	Optimum Moisture (% of dry wt.)	Soil Group Symbol
10.2	10'-15	—	—	100	97	86	66	55	52	50	48	44	43	43	40	32	24	18	38	18	20	2.77	118.3	14.4	SC
14.1	7.5'-8	19.1	106.6	—	—	100	99	98	96	92	84	53	45	45	38	27	18	15	26	15	10	2.81	—	—	SC
1.2	11'-16	—	--	—	100	95	88	80	70	60	54	48	47	47	46	43	33	27	32	14	18	2.75	121.6	12.8	SC
5A.1	23'-24.5'	24.6	96	--	—	100	98	94	89	88	70	60	49	49	39	22	15	10	26	18	8	2.78	--	--	SC ~~SM-SC~~
25.1	--	17.7	110.5	—	--	100	96	91	87	85	76	55	49	49	42	34	22	15	35	15	20	2.77	--	--	SC
32.2	12.5' 13'	17.8	113.3	—	100	95	88	81	77	71	64	53	50	50	47	40	28	21	38	16	22	2.70	—	--	SC-CL
13.4	20.5'- 21.0'	15.7	112.6	—	100	96	85	73	70	68	66	58	52	52	44	33	22	17	37	17	20	2.72	—	—	CL
19.3	15.5' 16.0'	20.1	108.9	—	—	--	—	100	99	98	88	63	53	53	40	31	21	16	27	14	13	2.71	—	--	CL
4.3	13'-20	—	--	--	100	92	85	80	75	70	67	57	54	54	49	43	33	26	38	18	20	2.79	—	--	CL

UNIFIED SOIL CLASSIFICATIONS   SC, SC-CL, CL

RANGE OF PROPERTIES

% Passing #200 Sieve	43-54%
Liquid Limit	26-38
Plasticity Index	8-22

GENERAL DESCRIPTION AND BEHAVIOR

This group consists clayey sands and sandy clays with some gravel in most samples. Proportions of sand and fines are about equal. These soils have good shear strength with medium values for Ø angles and cohesion. Permeabilities range from very low to hearly impervious for compacted samples. These soils will make good tight impervious fills but workability would be considered only fair. Erosion resistance would be considered high for these soils.

RANGE OF DESIGN VALUES

Unconfined Compressive Strength	1000-2000 psf
Triaxial Shear Strength	(estimated)
Ø	C
13^{0}	200 psf (Total Stress)
30^{0}	100 psf (Effective Stress)

Permeability $K=10^{-3}$ to 10^{-4} fpd

SOIL GROUP SUMMARY 5

Field Sample No.	Depth (ft.)	Natural Moisture (% of dry wt.)	Dry Density (lbs./cu.ft.)	GRAIN SIZE ANALYSIS % Passing U.S. Standard Sieve Sizes 1-1/2	3/4	3/8	#4	#10	#20	#40	#80	#140	#200	% Finer Micron Size 75	50	20	5	2	ATTERBERG LIMITS Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Maximum Density (lbs./cu. ft.)	Optimum Moisture (% of dry wt.)	Soil Group Symbol
25A.1	8.5'-11.2'	18.7	106.8	—	—	100	98	96	92	87	77	70	70	70	68	57	37	26	38	18	20	2.73	--	--	CL
28A.2	11'-14	22.4	97.2	--	—	100	98	96	95	94	91	79	72	72	62	48	31	22	34	7	21	2.77	--	--	CL
14.2	8'-14'	—	—	—	100	98	96	93	90	87	84	76	72	72	64	50	34	24	35	22	13	2.72	—	—	CL
27A.1	8'-11'	24.9	100.3	—	—	100	95	94	92	91	87	79	72	72	62	47	28	21	38	13	25	2.73	--	--	CL
9.1	6'-15'	—	—	—	—	100	97	95	94	91	86	77	73	73	70	55	37	26	39	16	23	2.75	108.9	18.9	CL
24.1	—	--	—	—	--	100	99	99	98	96	92	81	77	77	70	56	35	24	35	15	20	2.83	--	—	CL
7.1	--	21.9	103.7	--	—	100	97	95	94	92	90	81	77	77	74	74	66	32	37	19	18	2.73	—	—	CL
20.1	15'-17	--	—	--	--	100	99	98	97	97	94	84	77	77	73	69	42	32	39	18	21	2.75	--	--	CL
5.3	20.5'-21.5'	24.5	103.4	--	—	--	--	100	99	97	94	83	78	78	72	55	32	21	34	11	23	2.81	--	--	CL
6.1	--	--	--	--	--	--	--	100	97	94	91	82	77	77	73	64	43	32	39	16	23	2.71	--	--	CL

UNIFIED SOIL CLASSIFICATION CL

RANGE OF PROPERTIES

% Passing #200 Sieve	70-78%
Liquid Limit	34-39
Plasticity Index	13-25

GENERAL DESCRIPTION AND BEHAVIOR

These soils are sandy clays with only about 20-30% sand sizes. Shear strength is fair with a major portion of the strength represented by cohesion. Permeabilities are low to practically impervious depending on in-place densities. Erosion resistance is very good.

RANGE OF DESIGN VALUES

Unconfined Compressive Strength (except #9.1 which shows 650 psf)	1200-1600 psf
Traxial Shear Strength	(estimated)
Ø	C
15°	400 psf (Total Stress)
25°	100 psf (Effective Stress)

CA. LLAGAS CREEK REACH 3A-4-5-6

DRH 8-15-90

ROCK RIPRAP SIZE FOR CHANNEL 1 2

*"ROCK RIPRAP DESIGN" -A. ALMQUIST 1973

USE MODIFIED TR-25 METHOD* FOR LOOSE ROCK RIPRAP ON CHANNEL WHEN:

(a) $R > 500'$ & VEL. > 7.0 FPS
(b) $R \leq 500'$ & VEL. > 6.0 FPS.

USE PREVIOUS GRADATION FOR LOOSE ROCK AND GROUTED ROCK AT DROP STRUCTURES - IT HAS WORKED WELL IN THE PAST.

(a) $R > 500$ & $V > 7.0$

QUARRY ROCK TO BE SPECIFIED (ANGULAR TO SUBANGULAR)

(1) $V = 9.1$ FPS AT $R = \infty$ $h = 13.8$ FLOW DEPTH
(2) $V = 6.5$ FPS* AT $R = 600'$ $h = 14.2$ FLOW DEPTH

$$V_{s_1} = \frac{(0.72)(V_m)}{D\ A\ B}$$

SEE APPENDIX "B" OF "ROCK RIPRAP DESIGN" FOR CHARTS A, B, C.

A = ALIGNMENT FACTOR = 1.0 FROM CHART A

B = CHANNEL SIDESLOPE FACTOR

B = 0.72 FROM CHART B

D = DEPTH FACTOR FROM CHART D, @ h = 13.8, D = 1.29

$$V_{s_1} = \frac{(0.72)(9.1)}{(1.29)(1.0)(0.72)} = 7.1 \text{ FPS}$$

$$V_{s_2} = \frac{(0.72)(6.5)}{(1.29)(0.82)(0.72)} = 6.14 \text{ FPS}$$

$\left(R_T = \frac{600}{120} = 5.0\right)$

USE 7.1 FPS FOR BOTTOM OF CHANNEL & $R > 500'$
FROM FIG. 2 SPHERICAL DIA. = 0.25 FT $= D_{50} = 3''$

CA. LLAGAS CREEK REACH 3A-4-5-6

DRH 8-15-90

ROCK RIPRAP SIZE FOR CHANNEL 2 2

(b) $R \leq 500'$

(1) $V = 8.27$ AT $R = 300'$ BOTTOM OF CHANNEL

(2) $V = 6.7$ AT $R = 300$ SIDESLOPE, OUTSIDE BANK

(1) $V = 8.27$, $R = 300'$, $SS = 2{:}1$, $h = 14.4$

$R/T = 300/120 = 2.5$

$D = 1.29$

$B = 0.72$

$A = 0.72$

$$V_{S_1} = \frac{(0.72)(8.27)}{(1.29)(0.72)(0.72)}$$

$V_{S_1} = 8.90$ FROM FIG. 2 $D_{50} = 0.4$ FT. $= 4.8''$

(2) $V = 6.7$, $R = 300$, $SS = 2{:}1$, $h = 14.4$

$R/T = 2.5$

$D = 1.29$

$B = 0.72$

$A = 0.72$

$$V_{S_2} = \frac{(0.72)(6.7)}{(1.29)(0.72)(0.72)} = 7.2$$

FROM FIG #2 $D_{50} = 0.25$ FT. $= 3''$

CONCLUSION

CASE b (1) WITH $V = 8.27$ FPS, $R = 300'$, $h = 14.4$, $Se = 0.0005$, $n = 0.035$, $B = 33.0$, & $Z = 2$ IS THE WORST CASE WITH $D_{50} = 4.8''$. SINCE $4.8''$ IS NOT MUCH LARGER THAN $3''$, USE $D_{50} = 4.8''$ FOR ALL CHANNEL SECTIONS. CALIF. DEPT. OF TRANSP. BACKING NO. #2 HAS A $D_{50} = 4.6''$. USE THE CALTRANS NO. #2 FOR ECONOMY AND AVAILABILITY. CHECK STABILITY USING TR-25 — TRACTIVE STRESS. USE "CHANSTAB" PROGRAM TO DO THIS CHECK. SINCE CHANSTAB WILL NOT ACCEPT PARTICLE SIZES LARGER THAN $3.9''$, TRY CHECK WITH D_{75}, D_{65}, AND $D_{50} = 3.9''$. ACTUAL PARTICLE SIZES WOULD BE $D_{75} = 6''$, $D_{65} = 5.4''$, $D_{50} = 4.5''$. CHECK IS CONSERVATIVE.

CA LLAGAS CREEK REACH 3A-4-5-6

DRH 8-15-96

ROCK RIPRAP FOR DROP STRUCTURES 1 1

USE FWS 6-13C

$$D_s = \frac{3.5}{cK} w D S = D_{75}$$

D_s = ROCK SIZE IN INCHES FOR WHICH 75% OF ALL ROCK IS SMALLER BY WEIGHT

WORST CASE AT STATION 344+69

$w = 62.4$ $K = 0.72$ FOR $Z = 2$

$D = 12.1$ $c = 1.0$

$S = 0.00344$

$$D_s = \frac{(3.5)(62.4)(12.1)(0.00344)}{(1.0)(0.72)}$$

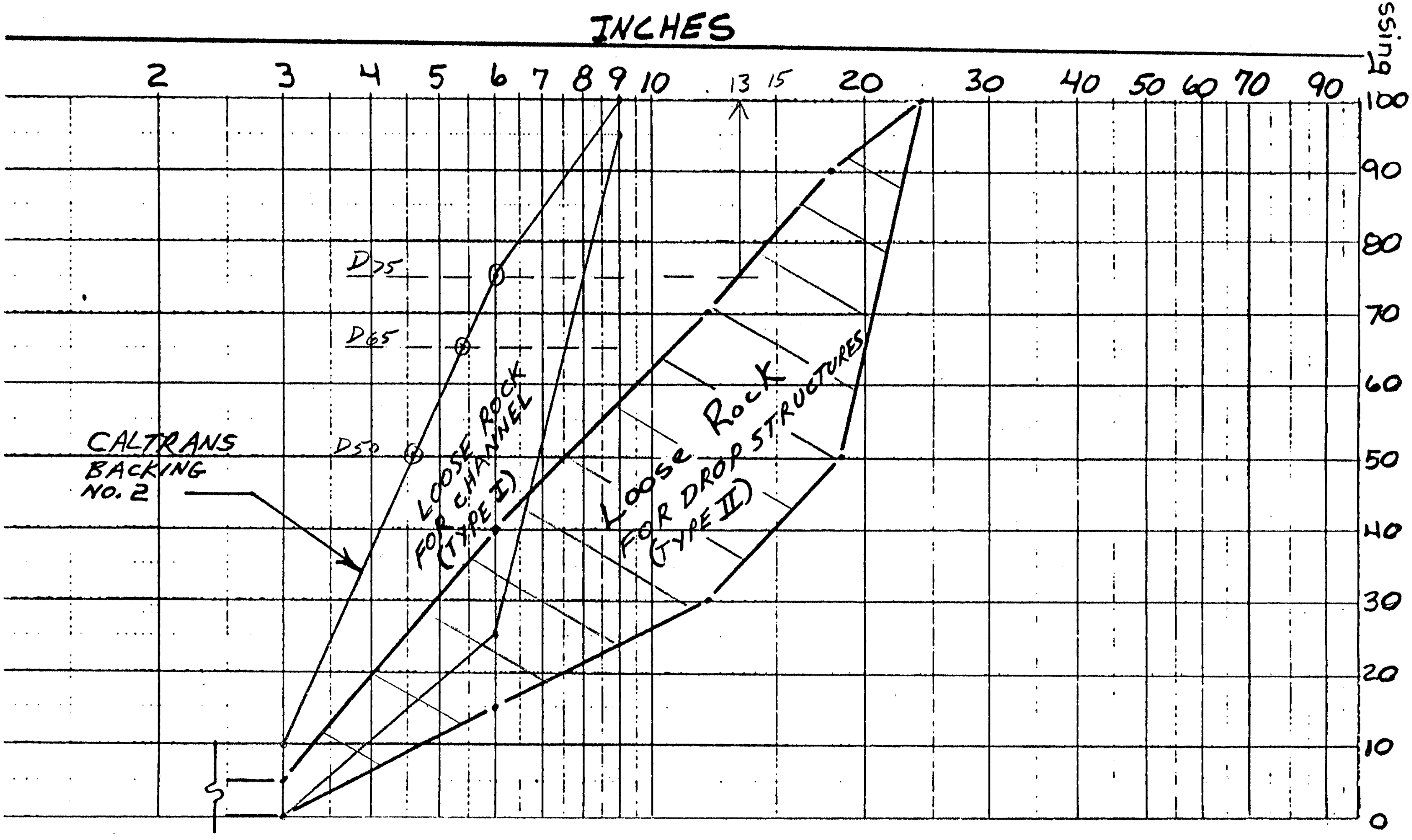
D_s = 12.6 INCHES

USE D_s = 13" FOR LOOSE ROCK IN VICINITY OF DROP STRUCTURES, i.e., BASINS AND UPSTREAM OF GROUTED ROCK NEAR CRESTS OF DROPS.

USE THE GRADATION WHICH HAS BEEN USED SUCCESSFULLY ON PREVIOUS DROP STRUCTURES:

GRID SIZE	% PASSING
24"	100
18"	50-90
12"	30-70
6"	15-40
3"	0-5

LLAGAS CREEK REACH 3A-4-5-6 LOOSE ROCK RIPRAP GRADATION 8/90



```
PROJECT: LLAGAS CREEK REACH 3A-4-5-6
STATION: 312+57
SAMPLE NO.: 1        STABILITY CHECK ON LOOSE ROCK RIPRAP -
BY: D. HALLSTROM      CALTRANS BACKING NO. 2
DATE: 8/15/90
SET NUMBER              1

 Q(cfs)      b(ft)     z          n         d(ft)      v(fps)
 ------      -----     -          -         -----      ------
 8100.       33.0     2.0        .035       13.8       9.10

 Rc(ft)      Lc(ft)       qu          Se
 -----  *    -----  *    -----        --
     .0          .0          .0     .0007

d75(mm)    d65(mm)    d50(mm)   tWATER        SEDLOAD
-------    -------    -------   ------        -------
99.000     99.000     99.000       60.              .0
3.9"       3.9"       3.9"
   ANGULARITY
   ----------                * NOT APPLICABLE
Very angular

Press "Return" to continue


d75(mm)    d65(mm)    d50(mm)   tWATER        SEDLOAD
-------    -------    -------   ------        -------
99.000     99.000     99.000       60.              .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


                                       Allowable Stress
   Tinf        Tb          Ts          TIb       TIs
   ----        --          --          ---       ---
  .487        .448        .369        1.559     1.138


 Tb (bottom)           IS STABLE   <--
 Ts (side)             IS STABLE

Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: LLAGAS CREEK REACH 3A-4 -5-6
STATION: 317+69
SAMPLE NO.: 1
BY: D. HALLSTROM
DATE: 8/15/90
SET NUMBER             1

 Q(cfs)      b(ft)    z        n       d(ft)     v(fps)
 ------      -----    -        -       -----     ------
 8100.       33.0    2.0     .035     13.1      10.62

 Rc(ft)     Lc(ft)     qu        Se
 ------     -----     -----      --
    .0         .0        .0    .0021

d75(mm)    d65(mm)    d50(mm)  tWATER      SEDLOAD
-------    -------    ------   ------      -------
99.000    99.000    99.000       60.             .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


d75(mm)    d65(mm)    d50(mm)  tWATER      SEDLOAD
-------    -------    ------   ------      -------
99.000    99.000    99.000       60.             .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


                                   Allowable Stress
   Tinf       Tb        Ts        Tlb        Tls
   ----       ---       ---       ---        ---
 1.450      1.341     1.099     1.559      1.138


 Tb (bottom)           IS STABLE  ←
 Ts (side)             IS STABLE


Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: LLAGAS CREEK REACH 3A-4 -5-6
STATION: 317+89
SAMPLE NO.: 1
BY: D. HALLSTROM
DATE: 8/15/90
SET NUMBER              1

 Q(cfs)      b(ft)     z          n        d(ft)      v(fps)
 ------      -----     -          -        -----      ------
 8100.       33.0     2.0       .035       13.6       9.44

 Rc(ft)     Lc(ft)      qu          Se
 ------     -----      -----        --
    .0         .0         .0     .0014

d75(mm)    d65(mm)    d50(mm)   tWATER      SEDLOAD
-------    -------    -------   ------      -------
99.000     99.000     99.000       60.            .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


d75(mm)    d65(mm)    d50(mm)   tWATER      SEDLOAD
-------    -------    -------   ------      -------
99.000     99.000     99.000       60.            .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


                                    Allowable Stress
   Tinf        To          Ts          Tlb        Tls
   ----        --          --          ---        ---
 1.004       .924        .760       1.559      1.138


 To (bottom)        IS STABLE   ←
 Ts (side)          IS STABLE


Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: LLAGAS CREEK REACH 3A-4-5-6
STATION: 332+99.20
SAMPLE NO.: 1
BY: D. HALLSTROM
DATE: 8/15/90
SET NUMBER            1

 Q(cfs)      b(ft)    z         n        d(ft)      v(fps)
 ------      -----    -         -        -----      ------
 8100.       33.0    2.0       .035      14.3       6.70

 Rc(ft)     Lc(ft)     qu         Se
 -----      -----     -----       --
 600.0      150.0        .0     .0007

d75(mm)    d65(mm)    d50(mm)   tWATER       SEDLOAD
-------    -------    -------   ------       -------
99.000    99.000     99.000       60.              .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue



Press "Return" to continue


                               Allowable Stress
 Tinf       Tb        Ts        Tlb       Tls
 ----       ---       ---       ---       ---
 .541      .496      .410     1.559     1.138

 Tbc        Tbt       Tsc       Tst
 ---        ---       ---       ---
 .520      .516      .430      .426


 Tb (bottom straight section)      IS STABLE
 Ts (side straight section)        IS STABLE
 Tbc (bottom in curve)             IS STABLE
 Tbt (bottom at curve tangent)     IS STABLE
 Tsc (side in curve)               IS STABLE
 Tst (side at curve tangent)       IS STABLE


Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: LLAGAS CREEK REACH 3A-4-5-6
STATION: 340+00
SAMPLE NO.: 1
BY: D. HALLSTROM
DATE: 8/15/90
SET NUMBER            1

 Q(cfs)      b(ft)    z        n       d(ft)     v(fps)
 ------      -----    -        -       -----     ------
 8100.       33.0    2.0      .035     14.4      8.27

 Rc(ft)     Lc(ft)      qu        Se
 -----      -----      -----      --
 300.0      150.0         .0    .0005

d75(mm)    d65(mm)    d50(mm)   tWATER      SEDLOAD
------     -------    ------    ------      -------
99.000    99.000     99.000       60.              .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


Press "Return" to continue


                              Allowable Stress
 Tinf       Tb        Ts         Tlb       Tls
 ----       ---       ---        ---       ---
 .405      .370      .306      1.559     1.138

 Tbc        Tbt       Tsc        Tst
 ---        ---       ---        ---
 .409      .401      .339       .331


 Tb (bottom straight section)      IS STABLE
 Ts (side straight section)        IS STABLE
 Tbc (bottom in curve)             IS STABLE     ←
 Tbt (bottom at curve tangent)     IS STABLE
 Tsc (side in curve)               IS STABLE
 Tst (side at curve tangent)       IS STABLE


Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

```
PROJECT: LLAGAS CREEK REACH 3A-4-5-6
STATION: 344+69
SAMPLE NO.: 1
BY: D. HALLSTROM
DATE: 8/15/90
SET NUMBER            1

 Q(cfs)      b(ft)    z        n        d(ft)     v(fps)
 ------      -----    -        -        -----     ------
 8100.       33.0    2.0      ,035      12.1      10.44

 Rc(ft)     Lc(ft)      qu        Se
 -----      -----      -----      --
    .0         .0         .0    .0034

d75(mm)   d65(mm)   d50(mm)  tWATER      SEDLOAD
------    -------   ------   ------      -------
99.000    99.000    99.000     60.            .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


d75(mm)   d65(mm)   d50(mm)  tWATER      SEDLOAD
------    -------   ------   ------      -------
99.000    99.000    99.000     60.            .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


                                    Allowable Stress
   Tinf      Tb         Ts          Tlb       Tls
   ----      ---        ---         ---       ---
  2.168     2.023      1.646       1.559     1.138

 Tb (bottom)      IS UNSTABLE
 Ts (side)        IS UNSTABLE

Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

∴ DO NOT USE CALTRANS BACKING NO.# 2
USE THE MUCH LARGER ROCK

```
PROJECT: LLAGAS CREEK REACH 3A-4-5-6
STATION: 344+97
SAMPLE NO.: 1
BY: D. HALLSTROM
DATE: 8/15/90
SET NUMBER           1

 Q(cfs)      b(ft)     z         n        d(ft)      v(fps)
 ------      -----     -         -        -----      ------
 8100.       33.0     2.0       .035      12.9       8.94

 Rc(ft)     Lc(ft)      qu         Se
 -----      -----      -----       --
    .0         .0         .0     .0018

d75(mm)    d65(mm)    d50(mm)   tWATER      SEDLOAD
------     -------    ------    ------      -------
99.000    99.000     99.000       60.             .0

   ANGULARITY
   ----------
Very angular

Press "Return" to continue


d75(mm)    d65(mm)    d50(mm)   tWATER      SEDLOAD
------     -------    ------    ------      -------
99.000    99.000     99.000       60.             .0

   ANGULARITY
   ----------
Very angular

Press "Return' to continue


                                  Allowable Stress
   Tinf       Tb         Ts         Tlb        Tls
   ----       ---        ---        ---        ---
 1.224      1.134       .928      1.559      1.138


 Tb (bottom)         IS STABLE   <-
 Ts (side)           IS STABLE


Do you want the results from this set sent to a
file to be sent to the printer (y or n)?
```

8. ROCK RIPRAP DESIGN

CALIF. LLAGAS CREEK REACH 3A-5
DRH 7-8-91

FILTER & BEDDING MATERIAL FOR
LOOSE ROCK AND GROUTED ROCK RIPRAP

THE SOILS FOR REACH 3A-5 ARE SIMILAR TO THOSE OF REACH 3A-4. THE SAME TYPE OF BEDDING GRADATION AND FILTER FABRIC, AND FILTER MATERIAL USED FOR REACH 3A-4 WILL BE USED FOR REACH 3A-5.

BEDDING, FILTER, AND FILTER FABRIC DETAILS ARE GIVEN ON THE SHEETS FOLLOWING THIS SHEET.

JUSTIFICATION STATEMENT

ALSO APPLIES TO REACH 3A
LLAGAS CREEK; REACHES 12 & 13
Contract No: 50-9104-8-2
Modification No. 7
July 6, 1989

By: ______________________
Contracting Officer's Representative

This modification changes the gradation requirements for Bid Item 13, Bedding Material, specified in Section 9.a.(2)(a).

On July 5, 1989, the Contractor called the Contracting Officer to verbally request a change in the gradation of the Bedding Material. The Contractor's rock supplier has not been able to meet the gradation limits specified.

The Contracting Officer reviewed this matter with the Contracting Officer's Representative and the State Design Engineer. The COR had called the SDE with results of two gradation tests of material placed that did not meet gradation requirements. The material was a finer gradation than specified. The Contracting Officer requested the State Design Engineer to review the matter to see if the material supplied would meet the technical requirements for the site.

It was determined that, from a design standpoint, the material will perform its function. In design, the bedding gradation specified was selected to fit a standard ASTM C-33 Coarse Aggregate size. The size selected was conservative and other sizes with a finer gradation would also work.

On a technical basis the material that has been place and is being supplied will meet a revised gradation and can be accepted.

On this basis, the Contracting Officer agreed to Modify the Contract to revise the gradation specifications. This will be a no cost modification that involves only a specification change. The advantage to the Government is to keep the project moving which will free Project Staff time for other work and the change will still meet the technical requirements of the project.

Section I-39, Changes, of the contract is applicable to this modification.

It is recommended this modification be approved.

Concurred by: ______________________ ______________
State Construction Engineer Date

Approved by: ______________________ ______________
State Conservation Engineer Date

1 of 5

SUBJECT: Wages 12 # 13/3 **DATE:** 7-5-89

FROM: Ed Denton
LOCATION: Gilroy

TO: Bill Ward
LOCATION: Davis

Re: Bedding Material Gradation

Ed says the contractor is having difficulty meeting the spec gradation for the bedding. He gave me the following test results

Sieve Size	Percent passing by wt		
	Specified	Test # 1	Test # 2
4"	100	100	100
3½"	90-100	90.3	78.6
2½"	25-60	85.3	63.7
1½"	0-15	33.4	11
¾"	0-5	2.3	0 ?

These gradations are somewhat finer then the spec calls for. Some of this material is in place & the contractor is ready to place loose rock. Is the bedding acceptable?

A review of the design report indicates that the bedding gradation specified was selected to fit a standard ASTM C-33 coarse aggregate size and

Sh 2 of 5

SUBJECT: Llagas 12 & 13/3 **DATE:**

FROM: Ed Denton	**TO:** Bill Ward
LOCATION:	**LOCATION:**

Re:

be sized so as to not be able to move through the voids in the rock riprap. This requires a check of the Soil Mechanics note 1 criteria as follows:

$$\underset{\text{(rock riprap)}}{D_{15\,\text{filter}}} \leq 4\,\underset{\text{(bedding)}}{d_{85\,\text{base}}}$$

Re-arranging, the d_{85} size of the base or bedding must be greater then D_{15} filter/4. The D_{15} filter (rock riprap) is 6". ∴ The d_{85} size of the base or bedding must be greater than 6"/4 = 1½". The d_{85} size in the spec gradation is very conservative (≈ 3").

The material tested has a d_{85} size of 2½" minimum and is ok from a design standpoint.

SUBJECT: Llagas 12.413/3

Sk 3 of 5

DATE:

FROM: Ed Denton

LOCATION:

TO: Bill Ward

LOCATION:

Re:

After discussion with Ed Denton & Mario Milani it was decided that a new gradation requirement should be given to the contractor which will allow a finer gradation but still maintain a minimum d_{85} size so as to prevent movement through the rock. The following gradation meets these objectives. Use this revised gradation.

Sieve Size	Percent Passing by wt
4"	100
3½"	75-100
2½"	25-95
1½"	0-80
3/4"	0-15

This results in a d_{85} size of about 1 3/4" which is greater than the 1½" min size.

Sh 4 of 5

SUBJECT: Hagos 12 & 13/3

DATE:

FROM: Ed Denton

LOCATION:

TO: Bill Ward

LOCATION:

Re:

The revised gradation is shown on the attached plot.

orig	Charles Davis,	Davis
	Sally Reed,	Davis
	Dave Rexroat	Davis
	Dave DeTullio	Davis
	Luana Kiger	Salinas
	Ed Denton	Gilroy

MATERIALS TESTING REPORT

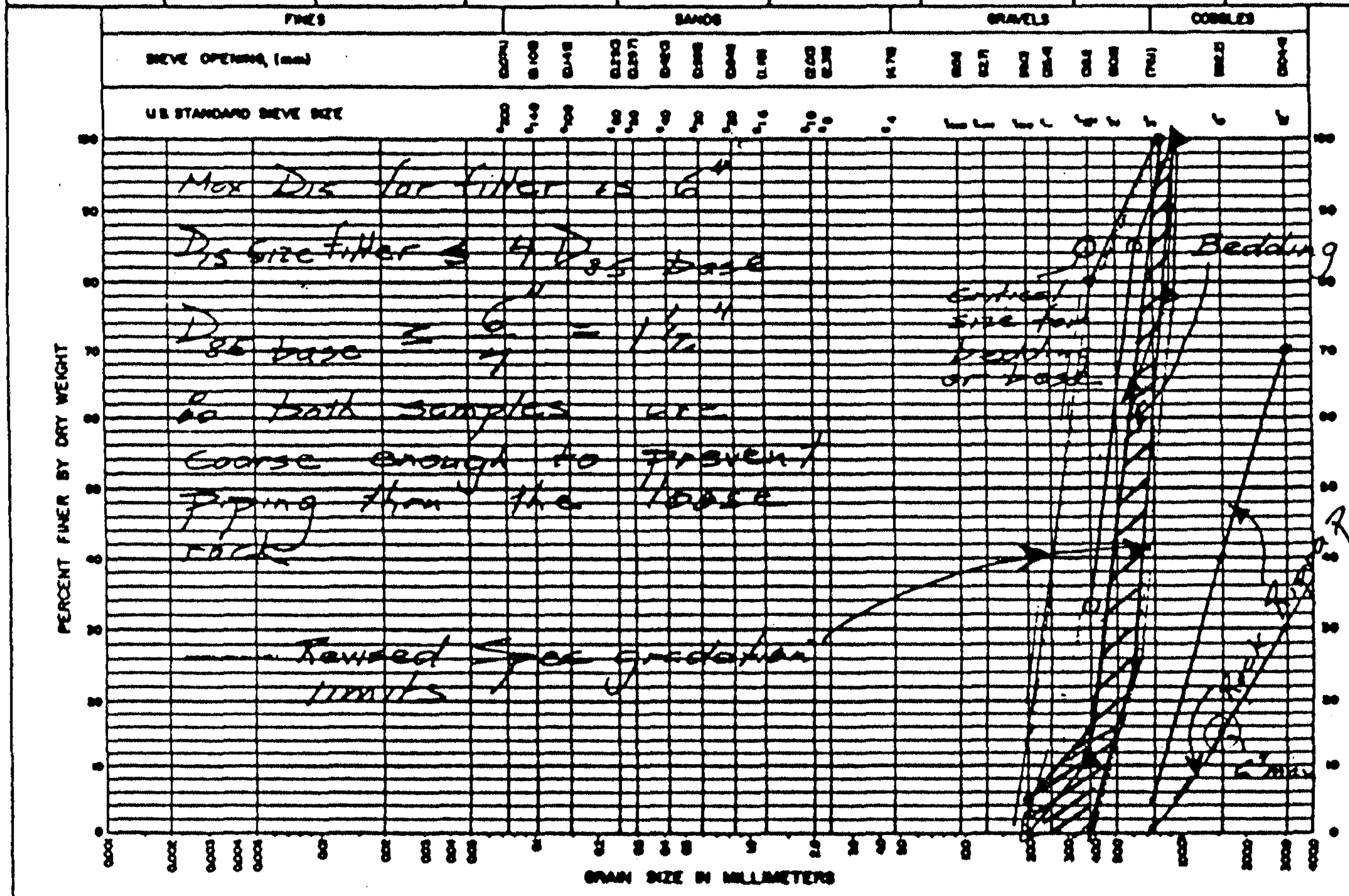
U. S. DEPARTMENT of AGRICULTURE SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION

PROJECT and STATE	Llagas 12 & 13/3
SAMPLE LOCATION	
FIELD SAMPLE NO.	1.
DEPTH	
GEOLOGIC ORIGIN	
TYPE OF SAMPLE	
TESTED AT	
APPROVED BY	
DATE	
SYMBOL	
DESCRIPTION	Bedding

GRAIN SIZE DISTRIBUTION

D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	D_{max}	C_u	C_c



Max D_{15} for filter is 6"

D_{15} size filter ≤ 4 D_{85} base

D_{85} base ≥ $\frac{6"}{4}$ = 1½"

∴ both samples are coarse enough to prevent piping thru the base rock

---- Revised spec gradation limits

SPECIFIC GRAVITY (G_s)		ATTERBERG LIMITS						SOLUBLE SALTS	SHRINKAGE LIMIT	UNDISTURBED CONDITION	
		NATURAL MOISTURE		AIR DRY		OVEN DRY				MOISTURE	DRY UNIT WEIGHT
(−) #4	(+) #4	LL	PI	LL	PI	LL	PI	%	%	%	g/cc pcf

REMARKS: Rock Riprap is a "filter" for the bedding which is the "base" material

Bill orig is the colored for the file
HT

MATERIALS TESTING REPORT

U. S. DEPARTMENT of AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION

LABORATORY NO.

PROJECT and STATE: LLAGAS CREEK REACH 3A-2, 3A-3, 3A-4,

SAMPLE LOCATION: 3A-5

FIELD SAMPLE NO.

DEPTH

GEOLOGIC ORIGIN

TYPE OF SAMPLE

TESTED AT

APPROVED BY

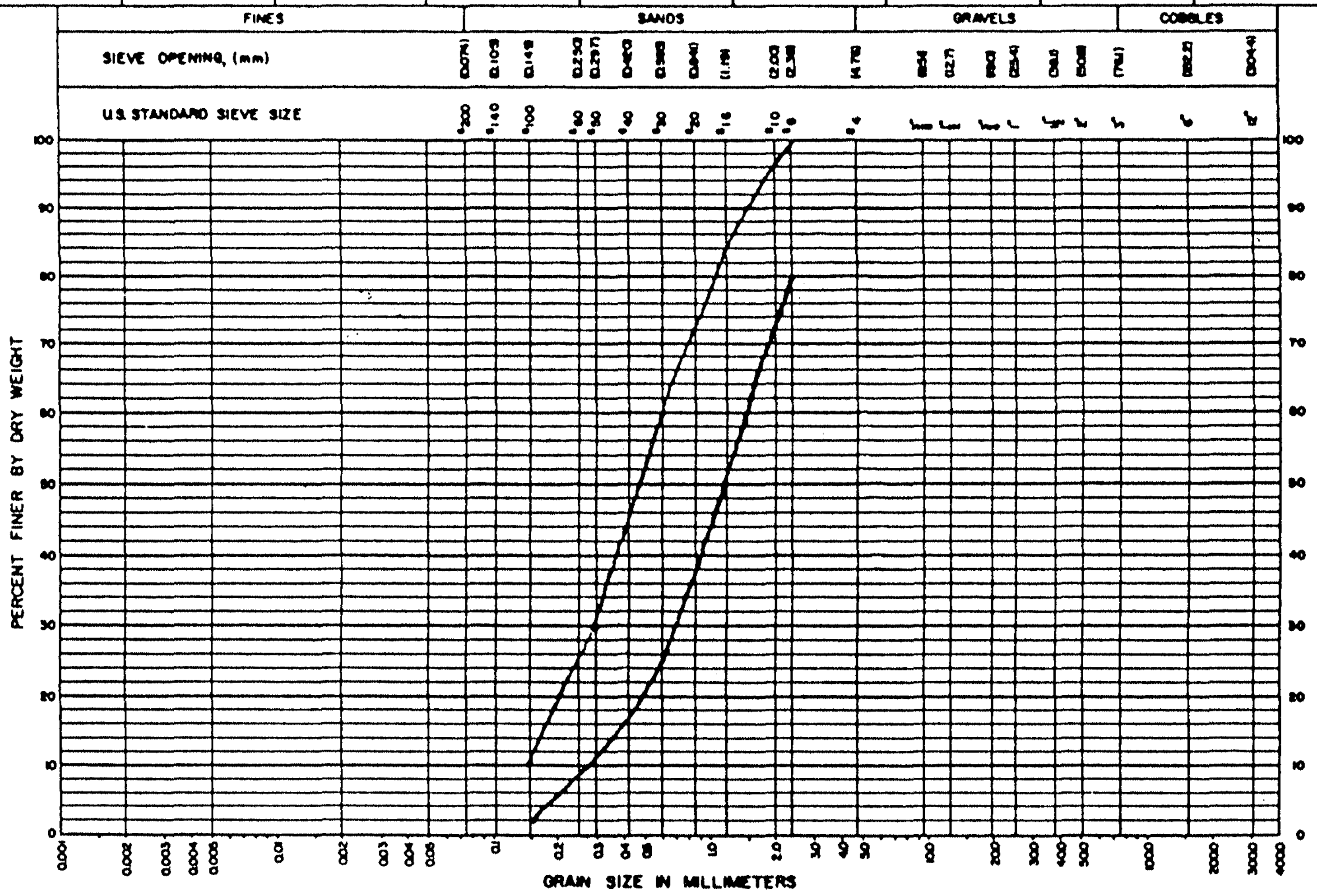
DATE: 1-4-88

SYMBOL

DESCRIPTION: FILTER MATERIAL UNDER GROUTED ROCK RIPRAP

GRAIN SIZE DISTRIBUTION

D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	D_{MAX}	C_u	C_c



SPECIFIC GRAVITY (G_s)		ATTERBERG LIMITS						SOLUBLE SALTS	SHRINKAGE LIMIT	UNDISTURBED CONDITION	
		NATURAL MOISTURE		AIR DRY		OVEN DRY				MOISTURE	DRY UNIT WEIGHT
(-) #4	(+) #4	LL	PI	LL	PI	LL	PI	%	%	%	g/cc pcf

REMARKS: CHECK SEGREGATION: $MIN. D_{10} = 0.15 MM$ ⇒ $MIN. D_{10} < 0.5 MM$ ⇒ ok
$MAX\ D_{90} = 2.5 MM$ $MAX\ D_{90} < 20 MM$

CA. LLAGAS CREEK REACH 3A-2/3A-3/3A-4/3A-5

DRH 1-4-88

FILTER FABRIC FOR LOOSE ROCK RIPRAP 1 1

FILTER FABRIC TO BE PLACED UNDER BEDDING MATERIAL FOR LOOSE ROCK RIPRAP

FIND SIEVE SIZE FOR FILTER FABRIC

USE $EOS \leq D_{85}/1.2$ PER SCS WEST SPECIFICATION 203

DRILL HOLE NO.	D_{85}
4.3	5.0 mm
4.1	0.28 mm
14.2	0.3 mm
15.1	0.045 mm
16.1	0.08 mm
27A.1	0.195 mm

LOOSE ROCK RIPRAP TO BE INSTALLED AT THREE LOCATIONS.

EXCLUDE LOWEST D_{85} VALUE
AVERAGE NEXT TWO LOWEST D_{85} VALUES

$$\frac{0.08 + 0.195}{2} = 0.14 \text{ mm}$$

$$EOS \leq \frac{D_{85}}{1.2} \leq \frac{0.14}{1.2} \leq 0.12 \text{ mm}$$

# 200 SIEVE = 0.075 mm ok
# 140 SIEVE = 0.10 mm ok
# 100 SIEVE = 0.15 mm TOO LARGE

USE #140 SIEVE SIZE OR SMALLER FOR FILTER FABRIC

9. SLOPE STABILITY

SLOPE STABILITY

LLAGAS CREEK REACH 3A-5

The soils and hydraulics for Reach 3A-5 are very similar to those in Reach 3A-2. The slope stability analysis for Reach 3A-2 will be used for Reach 3A-5.

CALIFORNIA LOWER LLAGAS CREEK, REACH 3A-2

MKH. 11/9/87

SLOPE STABILITIES

THE STABILITIES OF THE BANK ON THE WEST SIDE OF REACH 3A-2 have been calculated using the computer program SB-SLOPE. THE SB-SLOPE PROGRAM FINDS THE FACTOR OF SAFETY, F.S., for earth slopes using the Simplified Bishop method of slope stability analysis. THE ANALYSIS OPTIONS include

a. Phreatic or Ru methods for pore pressure
b. Free water surface
c. Horizontal and vertical earthquake coefficients for pseudo static analysis
d. Distributed loads and
e. Tension crack.

All analysis' done for Reach 3A-2 used the Phreatic line method for pore pressure. The horizontal and vertical earthquake coefficients were not used as the Soils Mechanics Report recommended.

CALIFORNIA LOWER LLAGAS CREEK, REACH 3A-2
MKH 11/9/87
SLOPE STABILITIES
2 2

THE STABILITIES OF THE BANKS, ON THE EAST SIDE OF THE CHANNEL NEAR HOLSCLAW Rd. HAVE NOT BEEN ANALYSED. THE EXISTING BANK WILL BE LEFT IN PLACE. Additional fill will be placED along the toe of this bank will can only improvE upon the existing F.S.

The dry densities were used in the analysis. These densities are lower than the actual field densities but this will make little difference in the min. F.S. that is found.

CALIFORNIA   LOWER LLAGAS CREEK, REACH 3A-2
MKH   11/2/87
SLOPE STABILITY   1   21

STATION 196+20 (Soil Boring 27) WEST BANK

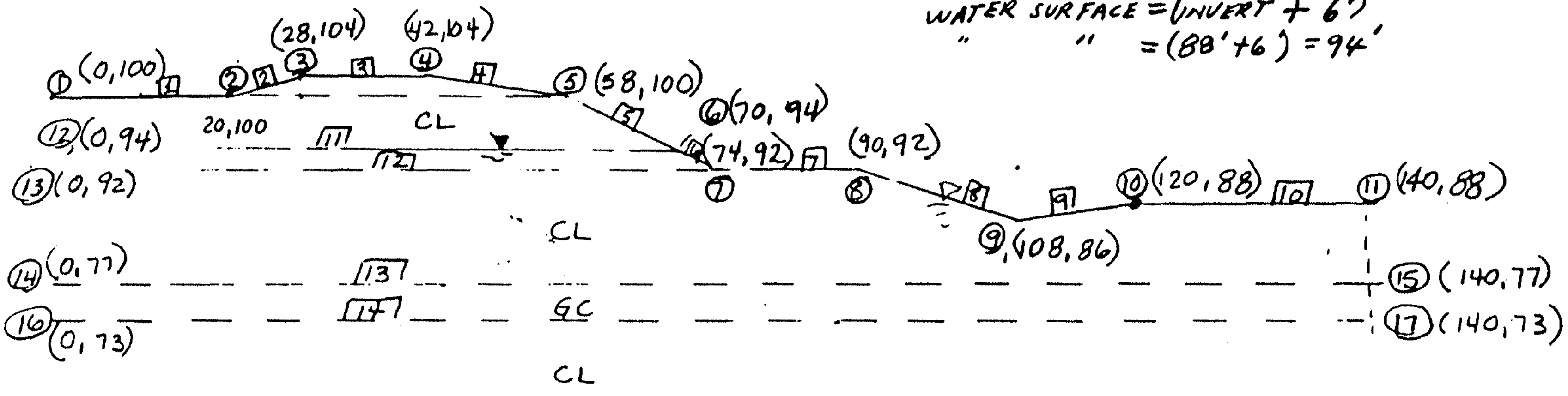
THE SOIL BORING # 27 was taken in the channel approximately 9 feet below the west bank. From the Geologic Report for Llagas Creek Reach 3 and 9, Santa Clara Co. California, OCTOBER 1982 by Jerald M Curry (hereafter described as Geologic Report) Plate 3, the soil in the bank above the location of the soil boring is the same as the TOPSOIL IN BORINGS 14, 15 & 16. STA. 196+20 is Located in the middle of the drop structure. This same soil boring will be used for the bank configuration at Sta. 202+40 where the channel is back to a typical section.

Configuration is shown on the next page.

THE SOIL BORINGS WERE TAKEN IN JUNE SO THE WATER TABLE IS LOW. FOR THE PURPOSE OF THE STABILITY PROGRAM A WORST CASE OF THE PHREATIC LINE IN THE BANK REACHING AN ELEV, OF 94 will be used.

THE ELEV. OF 94 IS AN ASSUMED REFERENCE ELEV. FOR THE SB-SLOPE PROGRAM AND IS NOT RELATED TO THE ACTUAL CHANNEL ELEVATIONS (USGS BASED ELEVATIONS). THE PHREATIC LINE IS TAKEN AT 6' ABOVE CHANNEL INVERT TO REPRESENT A PROBABLE LEVEL OF SATURATED SOIL AFTER A RAPID DRAWDOWN TO A NO FLOW CONDITION

CALIFORNIA
MKH 11/1/87
LOWER LLAGAS CREEK REACH 5A-2
SLOPE STABILITY, SOIL BORING 27.



WATER SURFACE = (INVERT + 6')
" " = (88' + 6') = 94'

According to the Soil Mechanics Report, Llagas Creek, Reaches 3 & 9, Santa Clara County, CALIFORNIA, SEISMIC COEFFICIENTS ARE NOT RECOMMENDED FOR INCLUSION IN THE STABILITY ANALYSIS.

THERE IS NO SOILS DATA FOR THE GC material. This will be treated as one of the clays on either side of it

THE COHESION & PHI DATA are as recommended by the Soil Mechanic Report

WATER IS ASSUMED IN THE CHANNEL TO AN ELEVATION OF 94. (6' DEPTH)

```
                                    SB-SLOPE

PROJECT DATA
Project: Lower Llagas Creek Reach 3A-2
Location: Soils Boring 27
Filename: LLAGAS3    Description: Soil Boring 27

ANALYSIS DATA
Line    Left      Left      Right     Right     Density  Cohesion  Phi    Phreatic
No.     X         Y         X         Y         pcf      psf       Deg    Line
  1        0.0     100.0      20.0     100.0    100.3       400     15     N
  2       20.0     100.0      28.0     104.0    100.3       400     15     N
  3       28.0     104.0      42.0     104.0    100.3       400     15     N
  4       42.0     104.0      58.0     100.0    100.3       400     15     N
  5       58.0     100.0      70.0      94.0    100.3       400     15     N
  6       70.0      94.0      74.0      92.0    100.3       400     15     Y
  7       74.0      92.0      90.0      92.0    100.3       400     15     Y
  8       90.0      92.0     108.0      86.0    100.3       400     15     Y
  9      108.0      86.0     120.0      88.0    100.3       400     15     Y
 10      120.0      88.0     140.0      88.0    100.3       400     15     Y
 11        0.0      94.0      70.0      94.0    100.3       400     15     Y
 12        0.0      92.0      74.0      92.0    100.3       400     15     N
 13        0.0      77.0     140.0      77.0     97.2       400     15     N
 14        0.0      73.0     140.0      73.0     97.2       400     15     N
```

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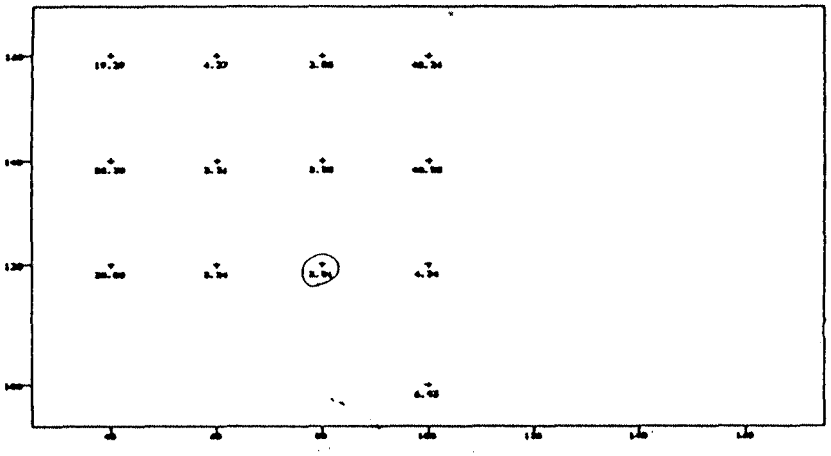
SB-SLOPE

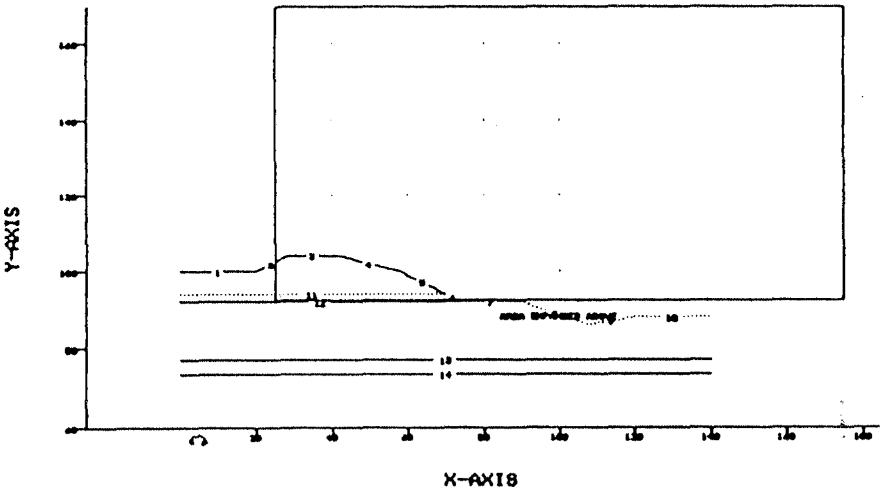
Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2

LOCATION: Soils Boring 27

FILE: LLA8A83





Soil Conservation Service - Davis, Calif.

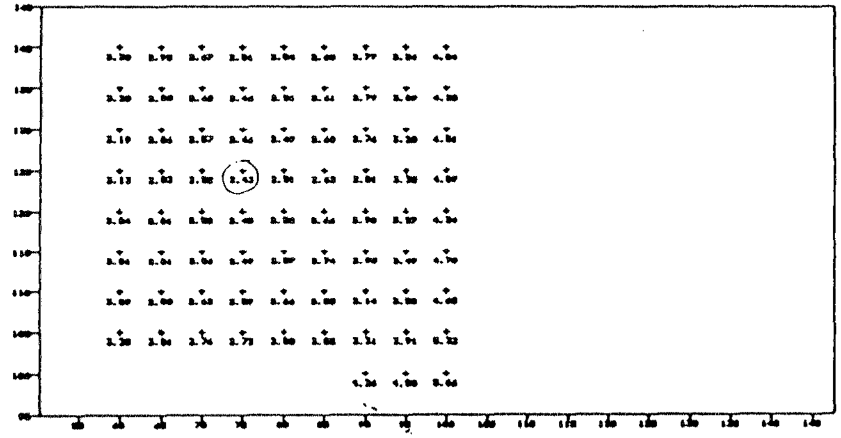
This is the preliminary run to determine an area of where the minimum F.S is located THE NUMBER OF SLICES USED FOR THE ANALYSIS WAS 15. MKH.

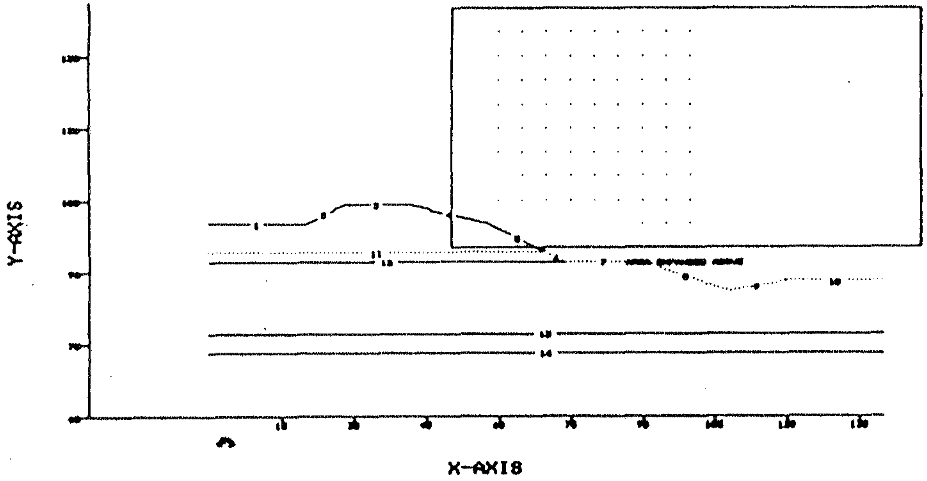
2 of 4

SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 27
FILE: LLAGA83





Soil Conservation Service - Davis, Calif.

THIS IS THE FINAL RUN TO DETERMINE WHERE THE MINIMUM F.S. IS LOCATED. THE SEARCH GRID WAS REFINED FOR THIS RUN TO BETTER DEFINE THE MINIMUM F.S. THE NUMBER OF SLICES USED FOR THIS ANALYSIS IS 20. THE MINIMUM F.S found is 2.43 at x = 75, y = 125. THIS F.S is adequate and we anticipate no problems with sliding of this bank. MFH.

F.S. > 1.5 ok

SB-SLOPE

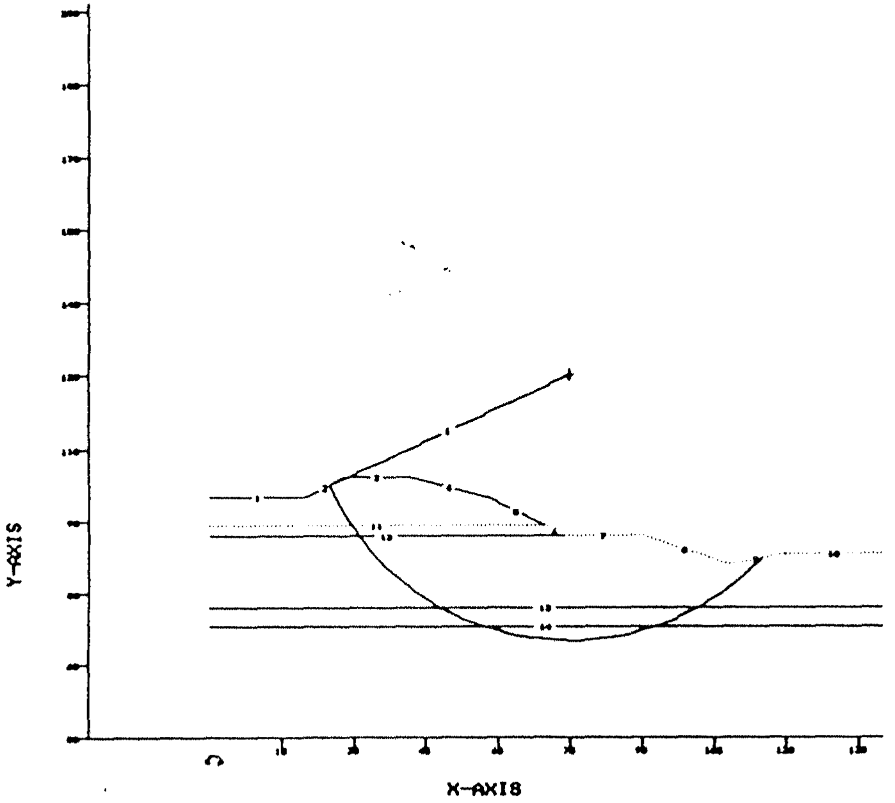
Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2

LOCATION: Soils Boring 27

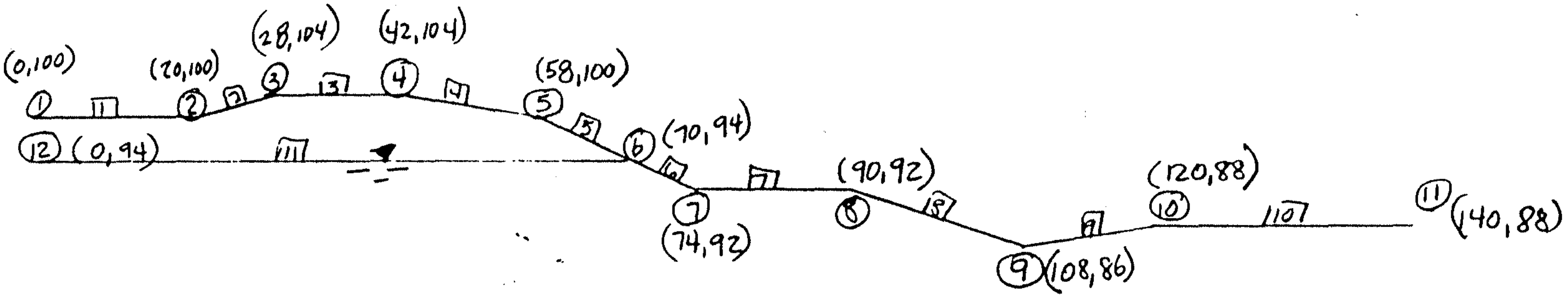
FILE: LLAGAS3 COMPLETE SLOPE CROSS SECTION

CIRCLE	X	Y	RADIUS	FS
1	75.0	125.0	53.0	2.43



Soil Conservation Service - Davis, Calif.

CALIFORNIA
LOWER LLAGAS CREEK, REACH 3A-2
MKH 11/9/87
SOILS BORING 16, SLOPE STABILITY
> 21



SOIL 1 density = 89.5, ϕ = 7, c = 1200 (THE DENSITY COMES FROM soil Boring 12.3 which has a LL and PL approximately the same as soil 16.1.) THE ϕ + c values are as recommended in the Soils Mechanics Report

Water is ASSUMED TO BE AT AN ELEV. OF 94 in the channel. Soil Boring 16 has a GC layer from 0-5 feet. THE SOIL PARAMETERS OF SOIL 16.1 will be used since this is the worst case and the soil parameters for the GC material are not determined.

```
                                SB-SLOPE

PROJECT DATA
Project: Lower Llagas Creek Reach 3A-2
Location: Soils Boring 16
Filename: LLAG16   Description: Soil Boring 16, Slope Stability

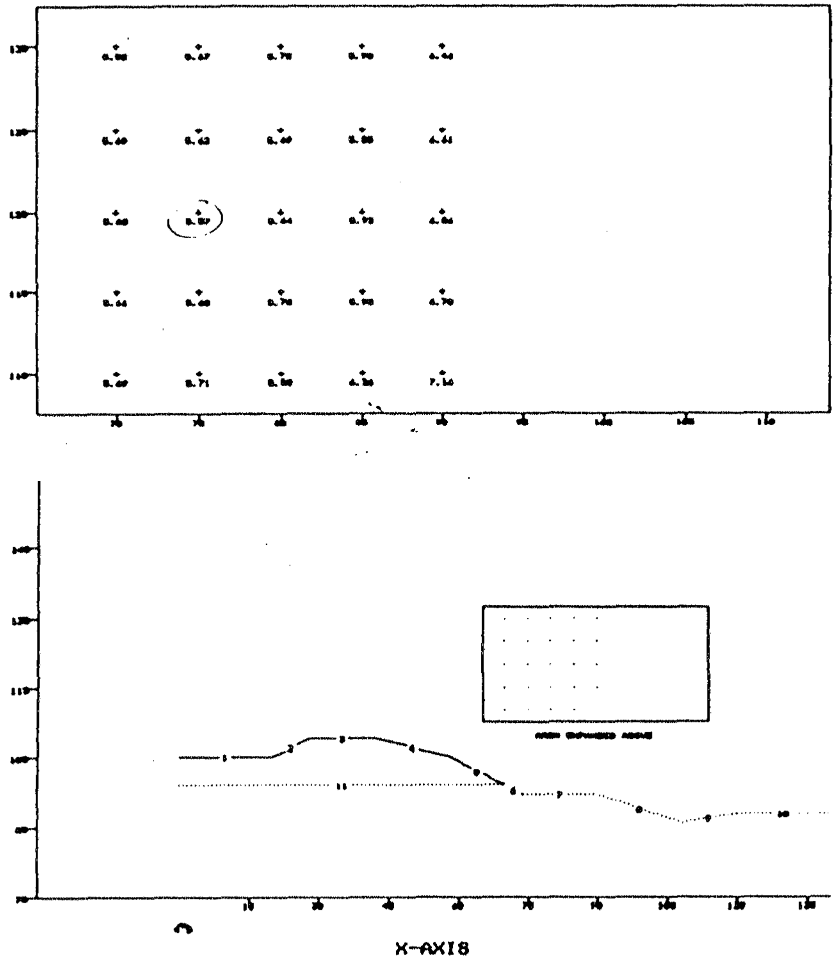
ANALYSIS DATA
Line    Left      Left      Right     Right     Density   Cohesion  Phi    Phreatic
No.     X         Y         X         Y         pcf       psf       Deg    Line
  1        0.0     100.0      20.0     100.0     89.5      1200      7     N
  2       20.0     100.0      28.0     104.0     89.5      1200      7     N
  3       28.0     104.0      42.0     104.0     89.5      1200      7     N
  4       42.0     104.0      58.0     100.0     89.5      1200      7     N
  5       58.0     100.0      70.0      94.0     89.5      1200      7     N
  6       70.0      94.0      74.0      92.0     89.5      1200      7     Y
  7       74.0      92.0      90.0      92.0     89.5      1200      7     Y
  8       90.0      92.0     108.0      86.0     89.5      1200      7     Y
  9      108.0      86.0     120.0      88.0     89.5      1200      7     Y
 10      120.0      88.0     140.0      88.0     89.5      1200      7     Y
 11        0.0      94.0      70.0      94.0     89.5      1200      7     Y
```

1208

SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 16
FILE: LLA016



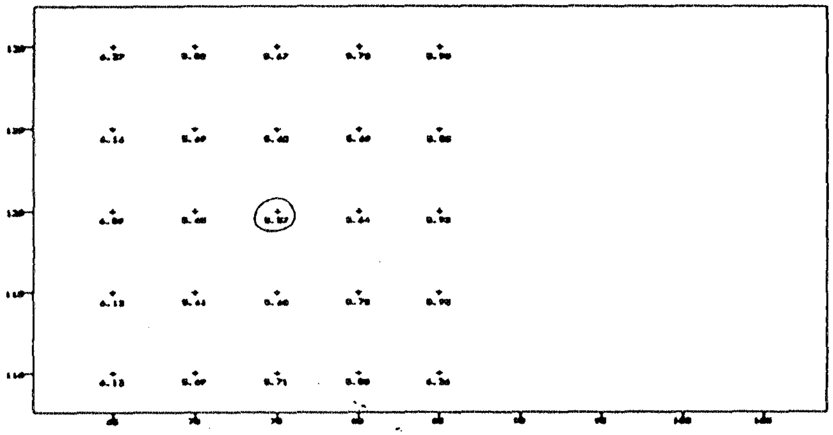
Soil Conservation Service - Davis, Calif.

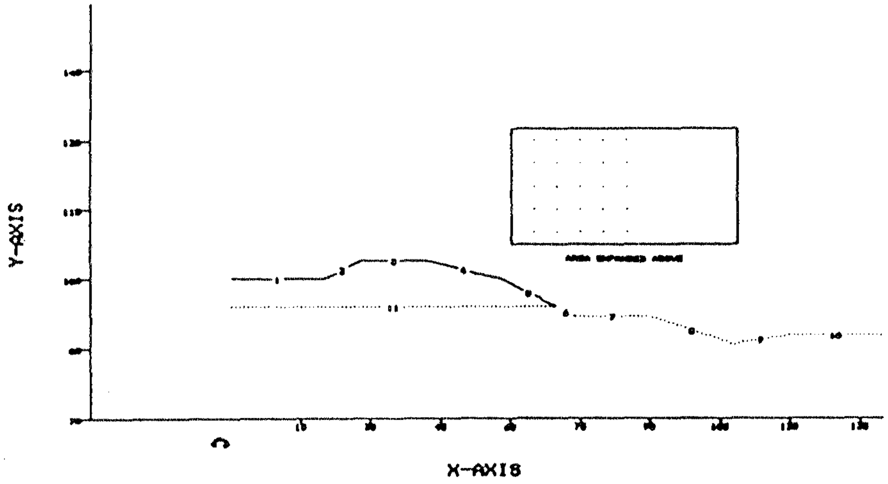
THIS IS THE PRELIMINARY RUN TO DETERMINE AN AREA OF WHERE THE MIN. F.S. IS Located. THE NUMBER OF SLICES USED FOR THIS RUN IS 15 MEH

SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 16
FILE: LLA016





Soil Conservation Service - Davis, Calif.

THIS IS THE FINAL RUN TO DETERMINE WHERE THE MIN. F.S. IS LOCATED. THE SEARCH GRID WAS REFINED TO BETTER DEFINE THE MINIMUM F.S. THE NUMBER OF SLICES USED FOR THIS ANALYSIS IS 20. THE MIN F.S. found is 5.57 at x = 75, y = 120, R = 55. THIS F.S. IS ADEQUATE AND WE ANTICIPATE NO PROBLEMS WITH SLIDING OF THIS BANK.

MLH

F.S. >1.5 ok

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SB-SLOPE

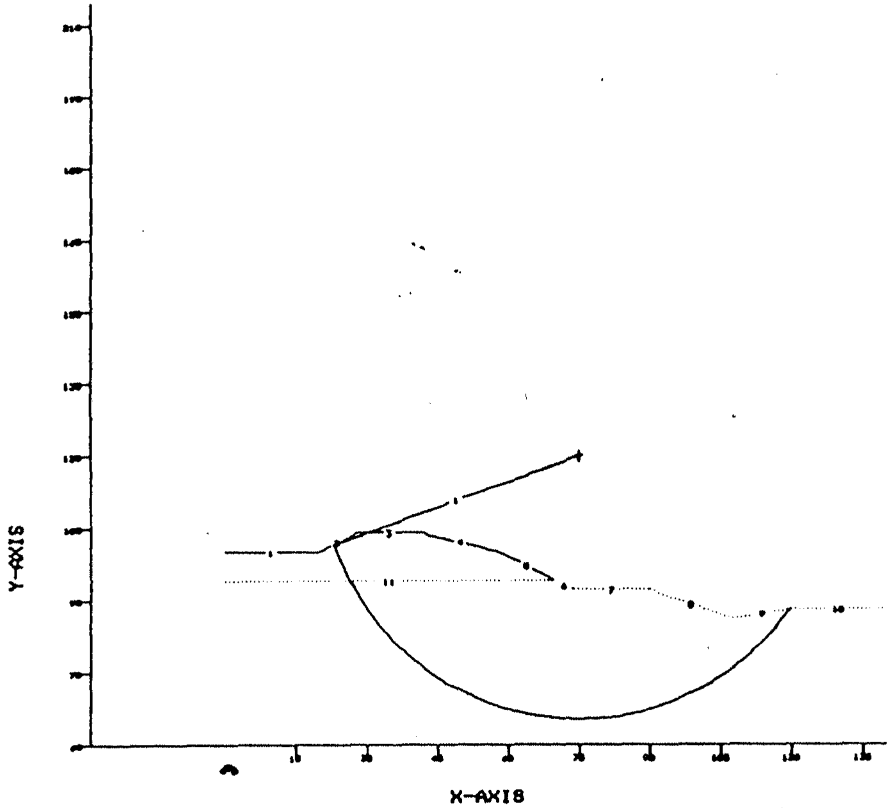
Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2

LOCATION: Soils Boring 16

FILE: LLA016 COMPLETE SLOPE CROSS SECTION

CIRCLE	X	Y	RADIUS	FS
1	75.0	120.0	55.0	5.57



Soil Conservation Service - Davis, Calif.

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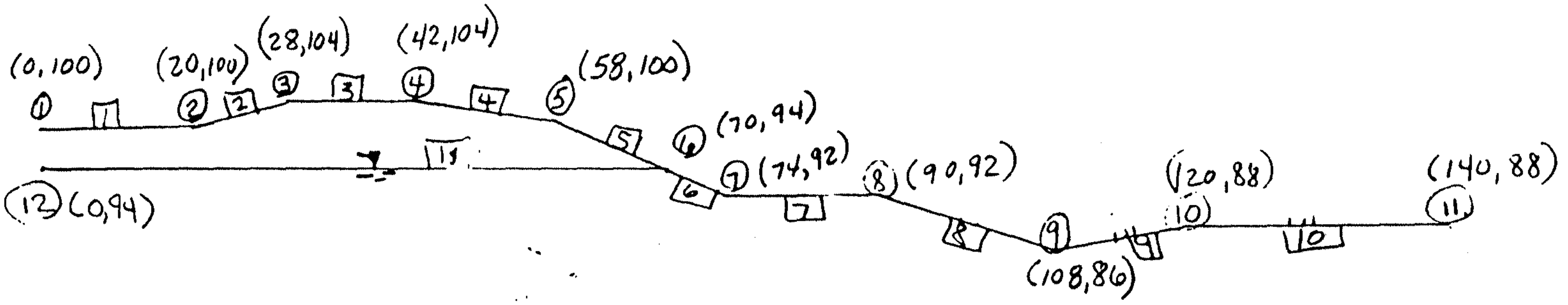
CALIFORNIA
MKH 11/9/87
SOIL BORING 15, SLOPE STABILITY
LOWER LLAGAS REACH 3A-2
12 21

FILE NAME LLAG15



Soil 15.1 c = 990 psf φ = 0 density = 97.2

THE SOIL MECHANICS REPORT DID NOT REPORT ANY TESTINGS FOR THE TOP SOIL TAKE FROM 0-5 ft. THIS MATERIAL IS ASSUMED TO BE THE SAME AS SOIL 15.1.

WATER IS ASSUMED IN THE CHANNEL TO AN ELEV. OF 94.

SB-SLOPE

PROJECT DATA
Project: Lower Llagas Creek Reach 3A-2
Location: Soils Boring 15
Filename: LLAG15   Description: Soil Boring 15, Slope Stability

ANALYSIS DATA

Line No.	Left X	Left Y	Right X	Right Y	Density pcf	Cohesion psf	Phi Deg	Phreatic Line
1	0.0	100.0	20.0	100.0	97.2	990	0	N
2	20.0	100.0	28.0	104.0	97.2	990	0	N
3	28.0	104.0	42.0	104.0	97.2	990	0	N
4	42.0	104.0	58.0	100.0	97.2	990	0	N
5	58.0	100.0	70.0	94.0	97.2	990	0	N
6	70.0	94.0	74.0	92.0	97.2	990	0	Y
7	74.0	92.0	90.0	92.0	97.2	990	0	Y
8	90.0	92.0	108.0	86.0	97.2	990	0	Y
9	108.0	86.0	120.0	88.0	97.2	990	0	Y
10	120.0	88.0	140.0	88.0	97.2	990	0	Y
11	0.0	94.0	70.0	94.0	97.2	990	0	Y

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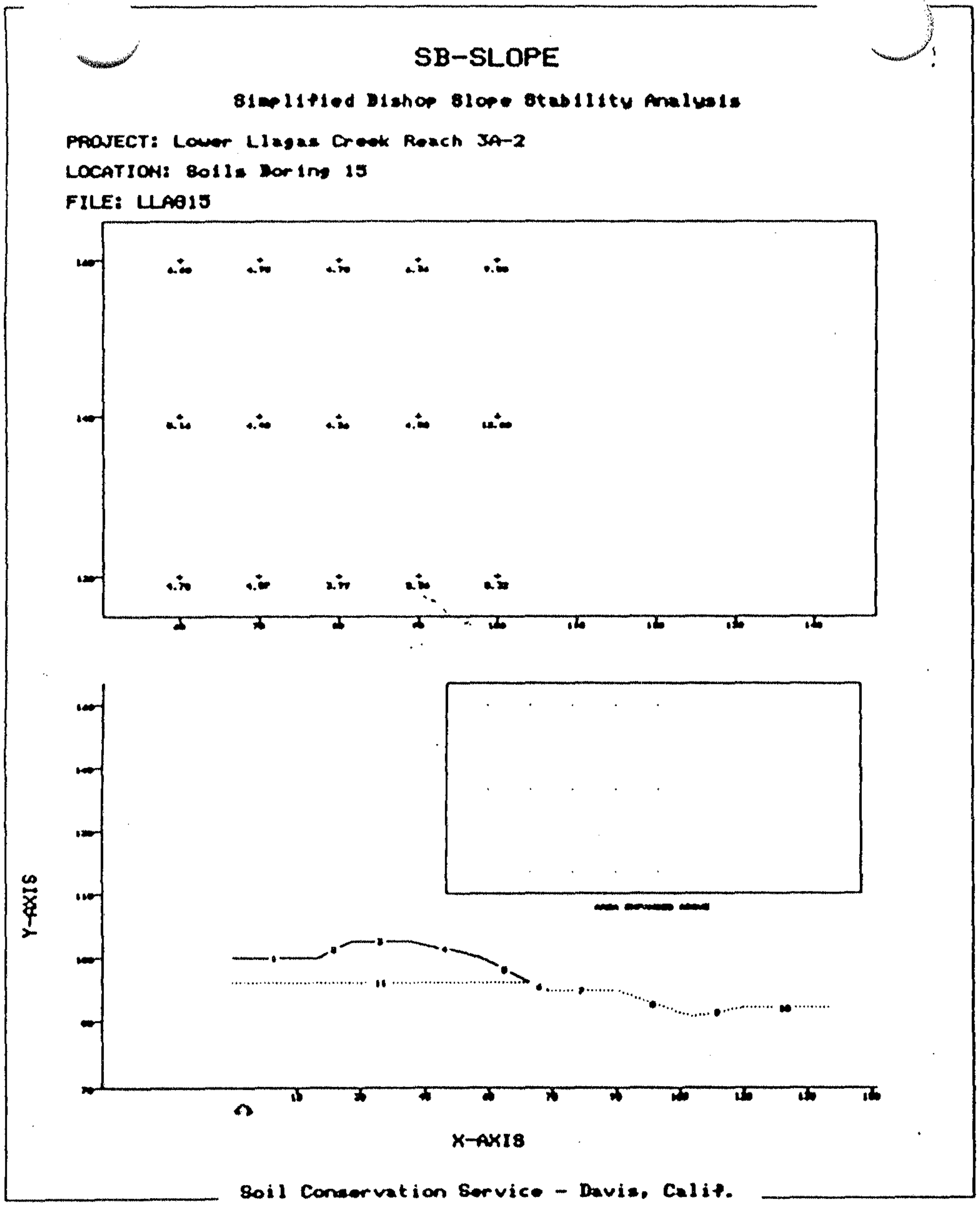


SB-SLOPE

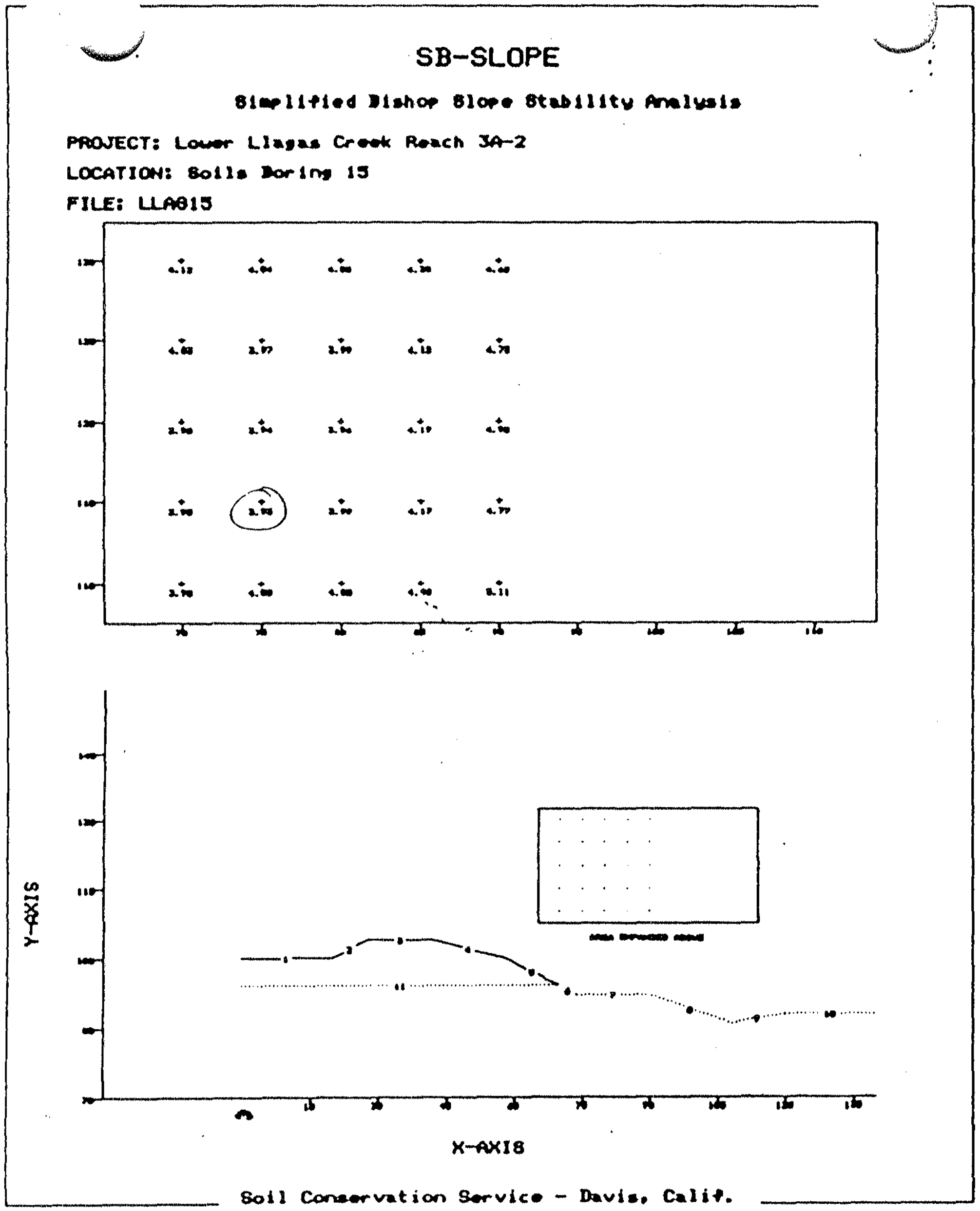
Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 15
FILE: LLA015

Soil Conservation Service - Davis, Calif.

THIS IS A PRELIMINARY RUN TO DETERMINE THE AREA WHERE THE MIN F.S. IS LOCATED. THE NUMBER OF SLICES USED FOR THIS ANALYSIS WAS 15

mkh



SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 15
FILE: LLA815

Soil Conservation Service - Davis, Calif.

THIS IS THE FINAL RUN TO DETERMINE WHERE THE MIN F.S. IS LOCATED. THE SEARCH GRID WAS BETTER DEFINED TO LOCATE THE MIN. F.S. MORE ACCURATELY. THE NUMBER OF SLICES USED FOR THIS ANALYSIS IS 20. THE MIN F.S. IS LOCATED at X = 75, y = 115 and R = 55. THIS F.S. IS ADEQUATE AND WE ANTICIPATE NO PROBLEMS WITH SLIDING OF THE BANK. THEN

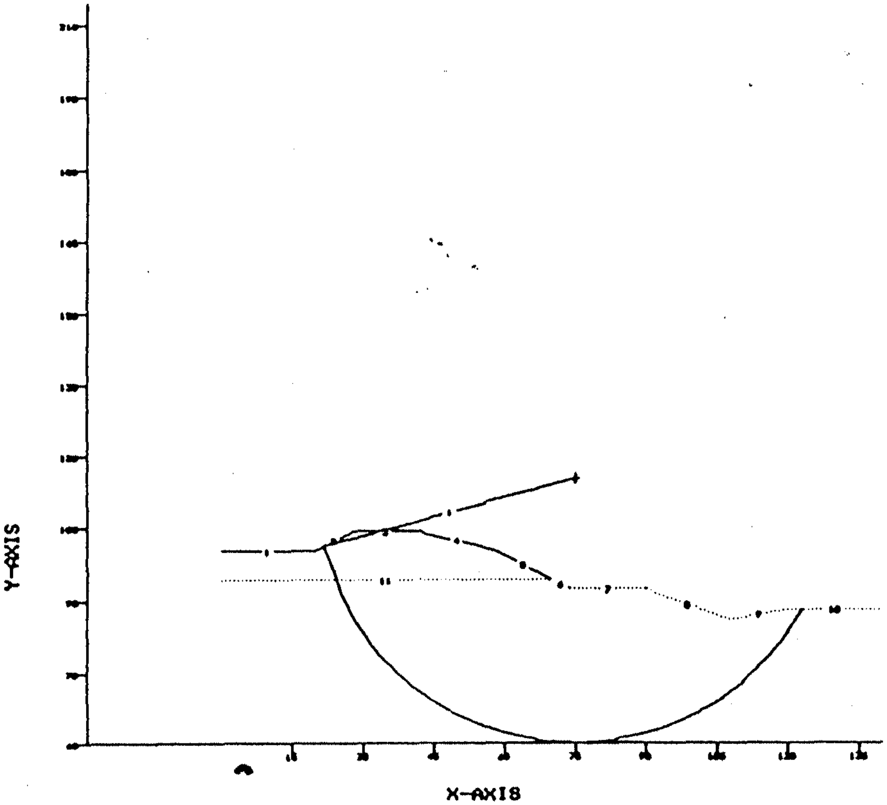
F.S. = 3.93 > 1.5 ok

SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 15
FILE: LLA015 COMPLETE SLOPE CROSS SECTION

CIRCLE	X	Y	RADIUS	FS
1	75.0	115.0	55.0	3.93



Soil Conservation Service - Davis, Calif.

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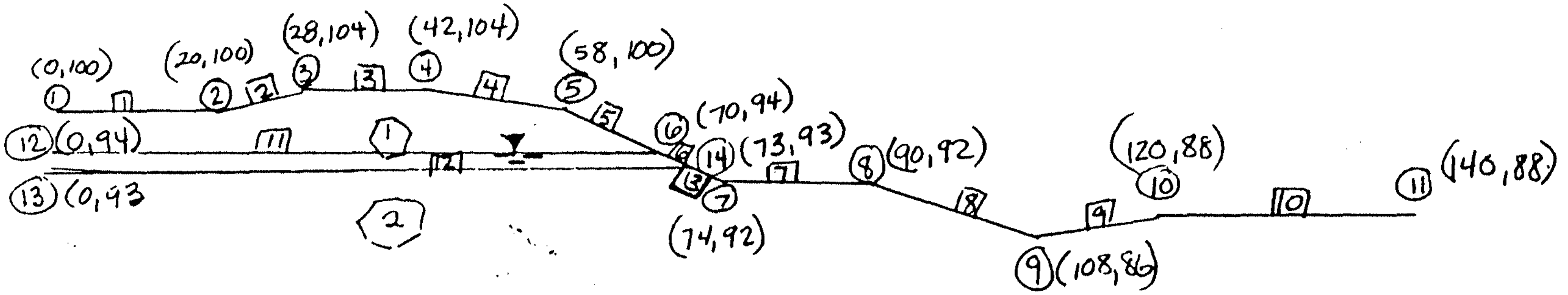
LOWER LLAGAS REACH 3A-2

CALIFORNIA

MKH

SOIL BORING 14, SLOPE STABILITY



Soil 1 density = 106.6, φ = 13°, C = 200 (recommended in Soil Mechanics report under Soil Group Summary 3.

Soil 2. density = 103.7 (used the density for soil type 7.1 since the LL & PL were close), φ = 15°, C = 400 psf as recomended in the soil mechanics report.

WATER IS ASSUMED TO BE IN THE CHANNEL to AN ELEVATION OF 94.

SB-SLOPE

PROJECT DATA
Project: Lower Llagas Creek Reach 3A-2
Location: Soils Boring 14
Filename: LLAGAS3   Description: Soil Boring ~~27~~ 14

```
ANALYSIS DATA
Line   Left     Left     Right    Right    Density  Cohesion  Phi   Phreatic
No.    X        Y        X        Y        pcf      psf       Deg   Line
  1       0.0    100.0     20.0    100.0   106.6      200     13    N
  2      20.0    100.0     28.0    104.0   106.6      200     13    N
  3      28.0    104.0     42.0    104.0   106.6      200     13    N
  4      42.0    104.0     58.0    100.0   106.6      200     13    N
  5      58.0    100.0     70.0     94.0   106.6      200     13    N
  6      70.0     94.0     73.0     93.0   106.6      200     13    Y
  7      74.0     92.0     90.0     92.0   103.7      400     15    Y
  8      90.0     92.0    108.0     86.0   103.7      400     15    Y
  9     108.0     86.0    120.0     88.0   103.7      400     15    Y
 10     120.0     88.0    140.0     88.0   103.7      400     15    Y
 11       0.0     94.0     70.0     94.0   106.6      200     13    Y
 12       0.0     92.0     73.0     93.0   103.7      400     15    N
 13      73.0     93.0     74.0     92.0   103.7      400     15    Y
```

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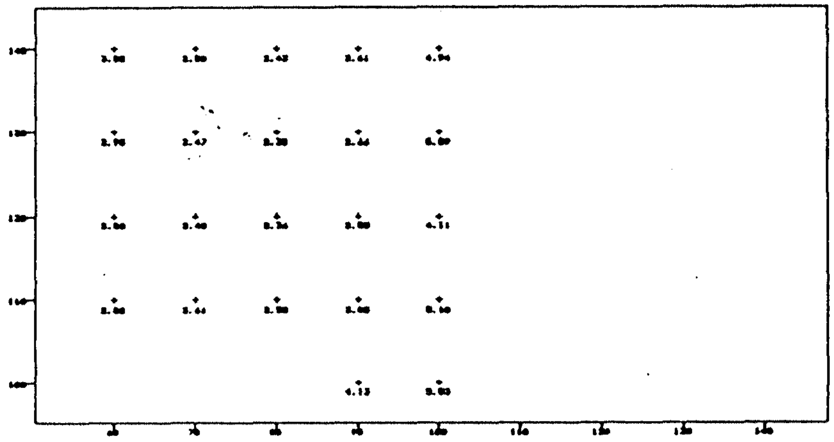
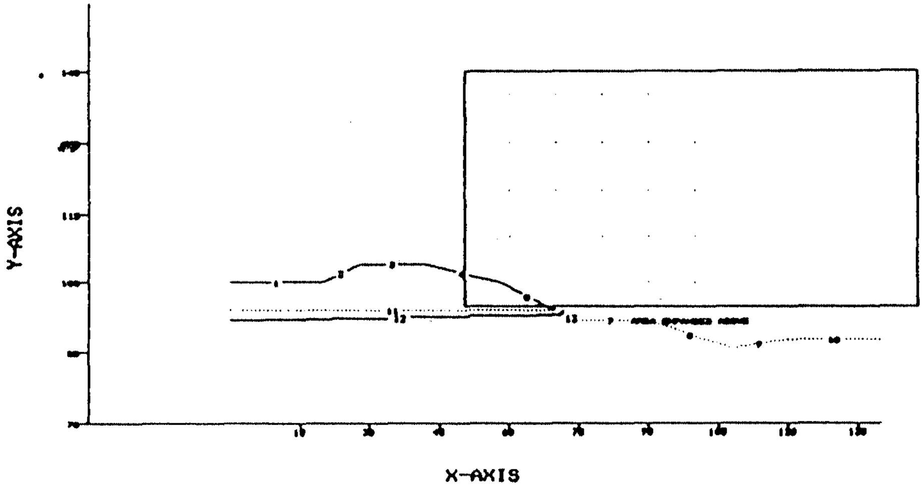
SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 14
FILE: LLABA83





Soil Conservation Service - Davis, Calif.

THIS IS THE PRELIMINARY RUN TO DETERMINE WHERE THE MINIMUM F.S. IS LOCATED. THE NUMBER OF SLICES USED FOR THIS ANALYSIS WAS 15. MKH

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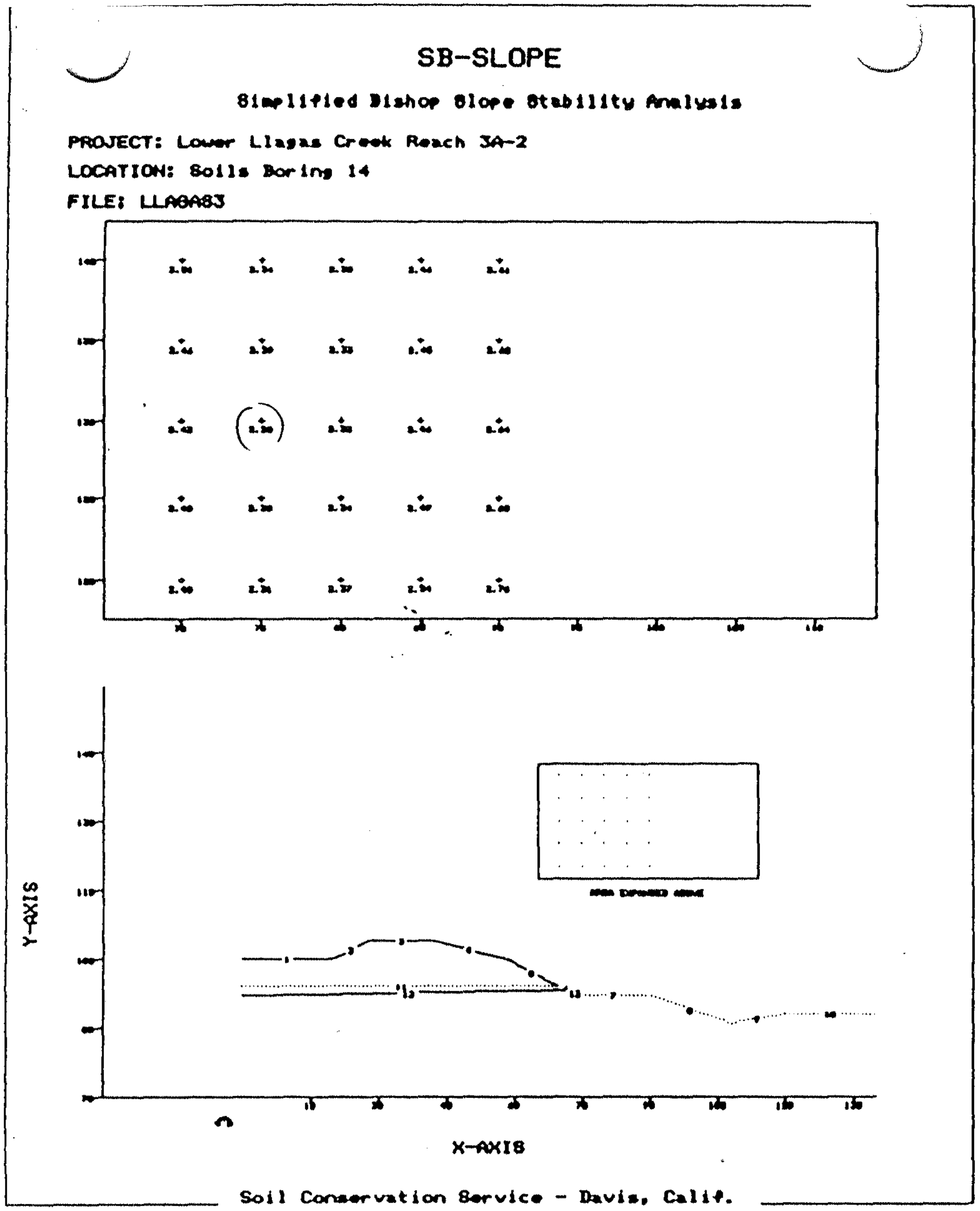

SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 14
FILE: LLAGA83

Soil Conservation Service - Davis, Calif.

THIS IS THE FINAL RUN TO DETERMINE THE MIN. F.S. AGAINST SLIDING. THE SEARCH GRID WAS REFINED AND THE NUMBER OF SLICES USED FOR THIS ANALYSIS WAS 20. THE MINIMUM F.S. FOUND IS 2.28 at 75, 130 and R = 55. THIS F.S. IS ADEQUATE AND WE ANTICIPATE NO PROBLEMS WITH SLIDING OF THIS BANK.
-MKH

F.S. > 1.5 ok

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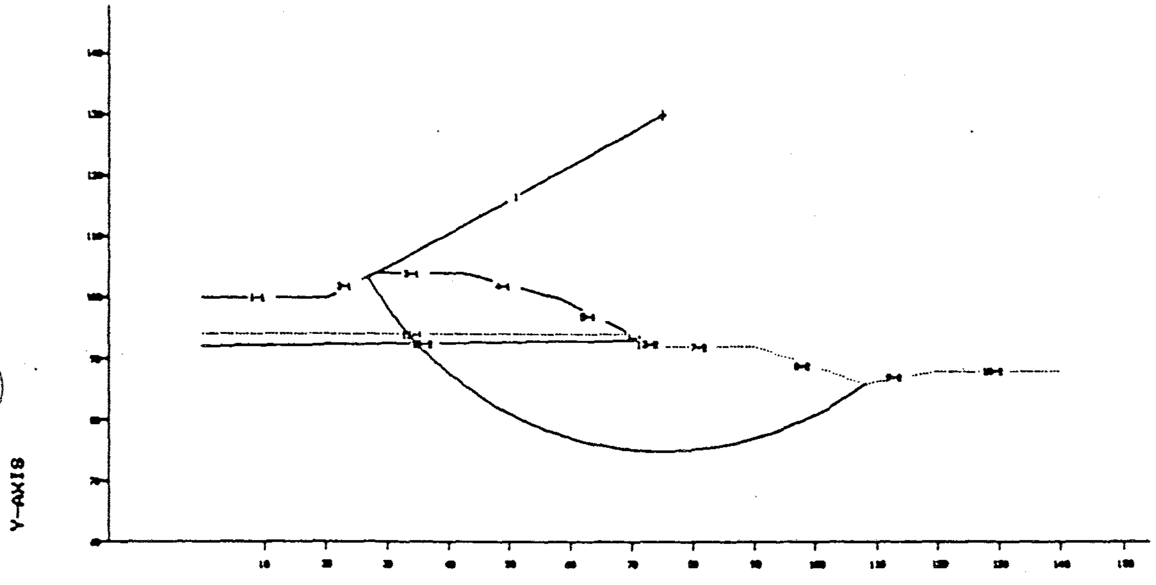
```
                              SB-SLOPE
              Simplified Bishop Slope Stability Analysis
PROJECT: Lower Llagas Creek Reach 3A-2
LOCATION: Soils Boring 14                          SOIL*    DENSITY    COHESION    PHI
FILE: LLA8AS3                                        1       106.6      200.0      13.0
COMPLETE SLOPE CROSS SECTION                         2       103.7      400.0      15.0

  CIRCLE       X        Y      RADIUS     FS
    1         75.0    130.0    55.0      2.28
```



* Number after hyphen('-') is Soil Type

Soil Conservation Service - Davis, Calif.

10. COMPUTER PROGRAM ABSTRACTS

a. WASP2

COMPUTER PROGRAM WASP2.BAS

WATER SURFACE PROFILES RECTANGULAR AND TRAPEZOIDAL CHANNELS

MARCH 1985

REVISED AUG, 1985

USDA SOIL CONSERVATION SERVICE
2828 CHILES ROAD
DAVIS, CALIFORNIA 95616

SUMMARY

This program is intended for calculating water surface profiles for steady gradually varied flow in man-made channels. Both subcritical and supercritial flow profiles can be calculated. The computational procedure is based on the solution of the one-dimensional energy equation with energy loss due to friction evaluated with the Manning's equation. The Standard Step Method is used to compute the water surface profile.

COMPUTER EQUIPMENT REQUIREMENTS

The WASP2 computer program was written for use on the Seattle Gazelle computer, but may be used with little or no change on most micro computers with the Basic language.

PROGRAM DEVELOPMENT

The WASP2 computer program was developed in the California SCS Design Section by Donald E. Twiss and David J. Sarvary. The program is derived from the general purpose trapezoidal channel hydralics program HYDRA developed by John Hanes. The water surface profile portion of HYDRA was enhanced with data file and preprossesor features for creating and storing input values.

THEORETICAL BASIS FOR CALCULATIONS

1. EQUATIONS FOR BASIC PROFILE CALCULATION

The following equations are solved by an iterative procedure to calculate an unknown water surface elevation at a cross section:

See figure 1

$$WS_2 + \frac{V_2^2}{2g} = WS_1 + \frac{V_1^2}{2g} + h_e \qquad (1)$$

$$h_e = LS_f + C\left|\frac{V_2^2}{2g} + \frac{V_1^2}{2g}\right| \qquad (2)$$

where

WS_1, WS_2 = water surface elevations (feet)
= depth + invert elevation

V_1, V_2 = mean velocities (cubic feet second)
= discharge/area

g = acceleration of gravity (feet squared per second)

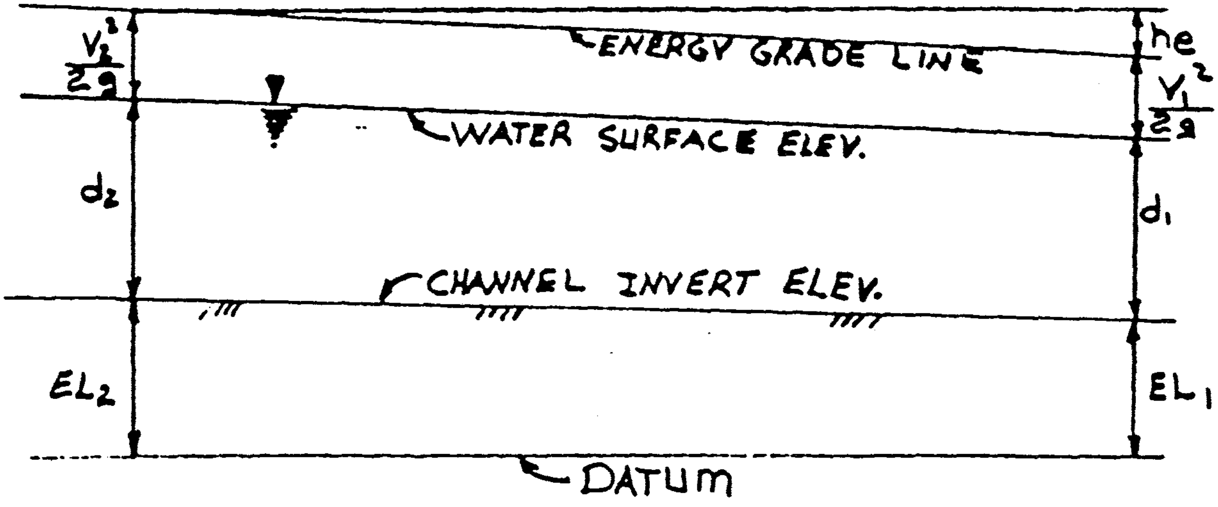
El = invert elevation (feet)

h_e = energy head loss (feet)

S_f = representative friction slope between cross sections

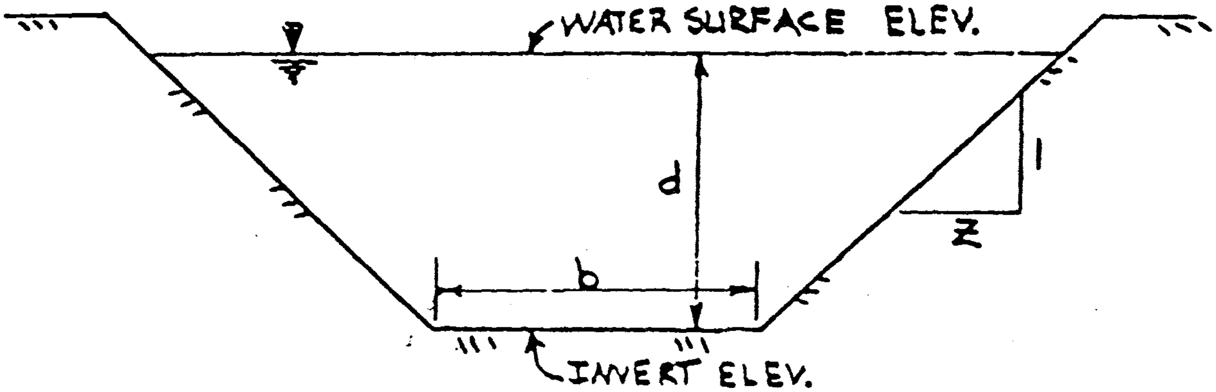
C = expansion or contraction loss coeficient

L = distance between cross sections (feet)



CHANNEL PROFILE

FIGURE 1.



CHANNEL CROSS SECTION

FIGURE 2.

The conveyance K is from the Manning's equation.

$$K = \text{[illegible]} = 1.486 a R^{2/3} \qquad (3)$$

where

K = conveyance
n = Manning's "N"
a = flow area (feet squared)
r = hydraulic radius (feet)

The friction Loss is evaluated as the product of S_f and L.

$$S_f = \left[\frac{(Q_1 + Q_2) n}{K_1 + K_2}\right]^2 \qquad (4)$$

where

Q_1, Q_2 = discharge or flow at each cross section (cubic feet per second).

K_1, K_2 = conveyance at each cross section.

The other equations used in this program are particular to rectangular and trapezoidal prizmoidal channels.

See Figure 2

$$a = bd + Zd^2 \qquad (5)$$

$$p = b + 2d(Z^2+1)^{\frac{1}{2}} \qquad (6)$$

$$r = a/p \qquad (7)$$

$$T = b + 2Zd \qquad (8)$$

$$Fr = \frac{V}{(ga/T)^{\frac{1}{2}}} \qquad (9)$$

where

a = area (feet squared)

d = depth (feet)

p = wetted perimeter (feet)

r = hydraulic radius (feet)

T = top width (feet)

Fr = Froude Number

b = bottom width (feet)

Z = side slope (Z:1)

2. EQUATIONS FOR PRESSURE AND MOMENTUM

Sequent depth is calculated by the pressure and momentum equations for use in determining hydraulic jump charateristics.

$$P_1 + M_1 = P_2 + M_2 \qquad (10)$$

$$P = \frac{d^2}{6}(3b+2Zd) \qquad (11)$$

$$M = \frac{Q^2}{(b+Zd)gd} \qquad (12)$$

where

P_1, P_2 = hydrostatic pressures (feet cubed)

M_1, M_2 = momentum (feet cubed)

3. EQUATIONS FOR FREEBOARD

Freeboard is calculated from the following equations:

	Subcritical	Supercritical
Rectangular section	0.1He	0.2d
Trapezoidal section	0.2He	0.25d

where

He = specific energy head (feet)

d = depth (feet)

BASIC DATA REQUIREMENTS

A major portion of the programming in WASP2 is devoted to providing a simple and quick method for computing water surface profiles in man-made rectangular or trapezoidal channels.

The data needed to perform these computions are:

1. Flow regime (subcritical/supercritical)
2. Beginning depth - d - (feet)
3. Station -sta - (feet)
4. Flow - Q - (c.f.s.)
5. Bottom width - B - (feet)
6. Side slope - Z - (feet/feet)
7. Invert elevation -EL - (feet)
8. Manning's 'n' - N -
9. Transition loss coefficient - C -

DATA FILE PROCESSING

The WASP2 program has an extensive data base management system built in.

The program is menu driven to reduce the effort in learning to use the program.

The following options are available from the main menu:

1. View
2. Search (by Station)
3. Add to or Create a file
4. Change (by Station)
5. Data File Processor
6. Delete (by Station)
7. Delete (Station to Station)
8. Save
9. Load
10. Print
11. Sort List (by Station)
12. Compute Water Surface Profile
13. Finish Session

DISCRIPTIONS OF OPTIONS

1. VIEW

The view option allows the array in memory to be shown on the monitor.

2. SEARCH

The Search by Station option can be used to check the other variables at a station of interest.

3. ADD TO OR CREATE A FILE

The Add or Create option allows data to be input to memory for one station at a time. This is particullary usefull to add Stations between those at an even increment prior to using the Data File Processor option. The other variables such as flow, bottom width, etc. can be added later with the Data File Processor option.

4. CHANGE (BY STATION)

The Change by Station option is similar to the Search by Station option but allows editing of the variables at the Station of interest.

5. DATA FILE PROCESSOR

The Data File Processor option allows rapid data file construction by automatically adding reptitious values to the array in memory. The beginning and ending Station is entered for all variables that are constant or vary linearly. The program adds the value of the variable entered to all Stations found in the array between and including the Stations entered. The following variables may change linerarly from the beginning Station to the ending Station:

a. Bottom Width

b. Side Slope

c. Invert Elevation

The beginning Station must always be smaller than the ending Station when using the Data File Processor option. This makes it perferable to build the data file from the smallest station to the largest station. The file can then be sorted using the Sort option to go upstream or downstream for subcritical or supercritical flow respectively.

6. DELETE (BY STATION)

The delete by Station option allows single Stations along with the other variables at that Station to be deleted. This is particularly useful when two stations with the same value have been entered. The program will not run with two Stations of the same value.

7. DELETE (STATION TO STATION)

This option will delete all Stations and their associated variables from and including the beginning to the ending station entered.

8. SAVE

This option writes the array in memory to a permanent disk file with the file name specified by the user.

9. LOAD

This option reads the data file specified by the user to an array in memory for editing or viewing.

10. PRINT

This option allows a "Saved" data file to be sent to the printer for a hardcopy.

11. SORT LIST (BY STATION)

This option is used to arrange in order the Stations with their asociated variables in memory. This should be done before saving all data sets. For subcritical flow the order is from downstream to upstream. For supercritical flow the order is from upstream to downstream.

12. COMPUTE WATERSURFACE PROFILE

This option reads a "Saved" data file from disk, calculates the water surface profile and prints the output on the printer.

13. FINISH SESSION

This option returns the computer to basic.

(1) $$WS_2 + \frac{V_2^2}{2g} = WS_1 + \frac{V_1^2}{2g} + h_e$$

(2) $$h_e = LS_1 + C\left|\frac{V_2^2}{2g} + \frac{V_1^2}{2g}\right|$$

(3) $$K = \frac{1.486ar^{2/3}}{[illegible]}$$

(4) $$S_1 = \left[\frac{(Q_1 + Q_2)\,n}{K_1 + K_2}\right]^2$$

(5) $$a = bd + Zd^2$$

(6) $$p = b + 2d(Z^2+1)^2$$

(7) $$r = a/p$$

(8) $$T = b + 2Zd$$

(9) $$Fr = \frac{V}{(ga/T)^{\frac{1}{2}}}$$

(10) $$P_1 + M_1 = P_2 + M_2$$

(11) $$P = \frac{d^2}{6}(3b+2Zd)$$

(12) $$M = \frac{Q^2}{(b+Zd)gd}$$

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                                                                                                    PAGE  1

P2''SUBCRITICAL WATER SURFACE PROFILE

                   TEST

COMPUTED BY:  D.TWISS    DATE:   4-10-1985   DATA FILE: A:WASP.DBF    CHECKED BY:________________    DATE:__________

STATION       Q         B       Z       Dc      DEPTH    AREA    VELOC    E.G.L    INV EL    W.S.EL    FREE   FROUDE  SEQUENT

  ft         cfs       ft               ft       ft      sq ft    fps      ft       ft        ft      BOARD  NUMBER   DEPTH

1+00.00   2000.00   20.00    2.00    5.580    5.600    174.7    11.45   107.63    100.00    105.60    7.13    0.99    5.55

           n=0.0250       So=0.001000      Sf=0.004161     Headloss Factor=0.000    Total Headloss=0.416 ft.    Se=0.004161

2+00.00   2000.00   20.00    2.00    5.580    6.722    224.8     8.90   108.05    100.10    106.82    8.31    0.72    4.56

           n=0.0250       So=0.001000      Sf=0.002749     Headloss Factor=0.000    Total Headloss=0.275 ft.    Se=0.002749

3+00.00   2000.00   20.00    2.00    5.580    7.052    240.5     8.32   108.33    100.20    107.25    8.68    0.66    4.30

           n=0.0250       So=0.001000      Sf=0.002357     Headloss Factor=0.000    Total Headloss=0.236 ft.    Se=0.002356

[illegible] 2000.00   20.00    2.00    5.580    7.280    251.6     7.95   108.56    100.30    107.58    8.93    0.62    4.13

           n=0.0250       So=0.001000      Sf=0.002114     Headloss Factor=0.000    Total Headloss=0.211 ft.    Se=0.002114

5+00.00   2000.00   20.00    2.00    5.580    7.456    260.3     7.68   108.77    100.40    107.86    9.13    0.59    4.01

           n=0.0250       So=0.001000      Sf=0.001944     Headloss Factor=0.000    Total Headloss=0.194 ft.    Se=0.001944

 +00.00   2000.00   20.00    2.00    5.580    7.599    267.5     7.48   108.97    100.50    108.10    9.29    0.57    3.91

           n=0.0250       So=0.001000      Sf=0.001816     Headloss Factor=0.000    Total Headloss=0.182 ft.    Se=0.001816

 +00.00   2000.00   20.00    2.00    5.580    7.719    273.5     7.31   109.15    100.60    108.32    9.43    0.56    3.83

           n=0.0250       So=0.001000      Sf=0.001716     Headloss Factor=0.000    Total Headloss=0.172 ft.    Se=0.001716

 +00.00   2000.00   20.00    2.00    5.580    7.821    278.8     7.17   109.32    100.70    108.52    9.55    0.54    3.76

           n=0.0250       So=0.001000      Sf=0.001635     Headloss Factor=0.000    Total Headloss=0.164 ft.    Se=0.001635

 +00.00   2000.00   20.00    2.00    5.580    7.910    283.4     7.06   109.48    100.80    108.71    9.65    0.53    3.71

           n=0.0250       So=0.001000      Sf=0.001568     Headloss Factor=0.000    Total Headloss=0.157 ft.    Se=0.001568

  00.00   2000.00   20.00    2.00    5.580    7.989    287.4     6.96   109.64    100.90    108.89    9.74    0.52    3.66
```

b. OVERBANK

"OVERBANK"

GENERAL EQUATIONS

$$WS_U = WS_D + \alpha_D \frac{V_D^2}{2g} - \alpha_U \frac{V_U^2}{2g} + h_e$$

② $$h_e = c\left(\alpha_u \frac{V_u^2}{2g} - \alpha_D \frac{V_D^2}{2g}\right) + L\left[\frac{Q}{\frac{K_1+K_2}{2}}\right]^2$$

1- ASSUME WS_u

2- CALCULATE $\alpha_u \frac{V_u^2}{2g}$ AND h_e

3- CALCULATE WS_u USING ①

4- COMPARE AND REPEAT IF NEEDED

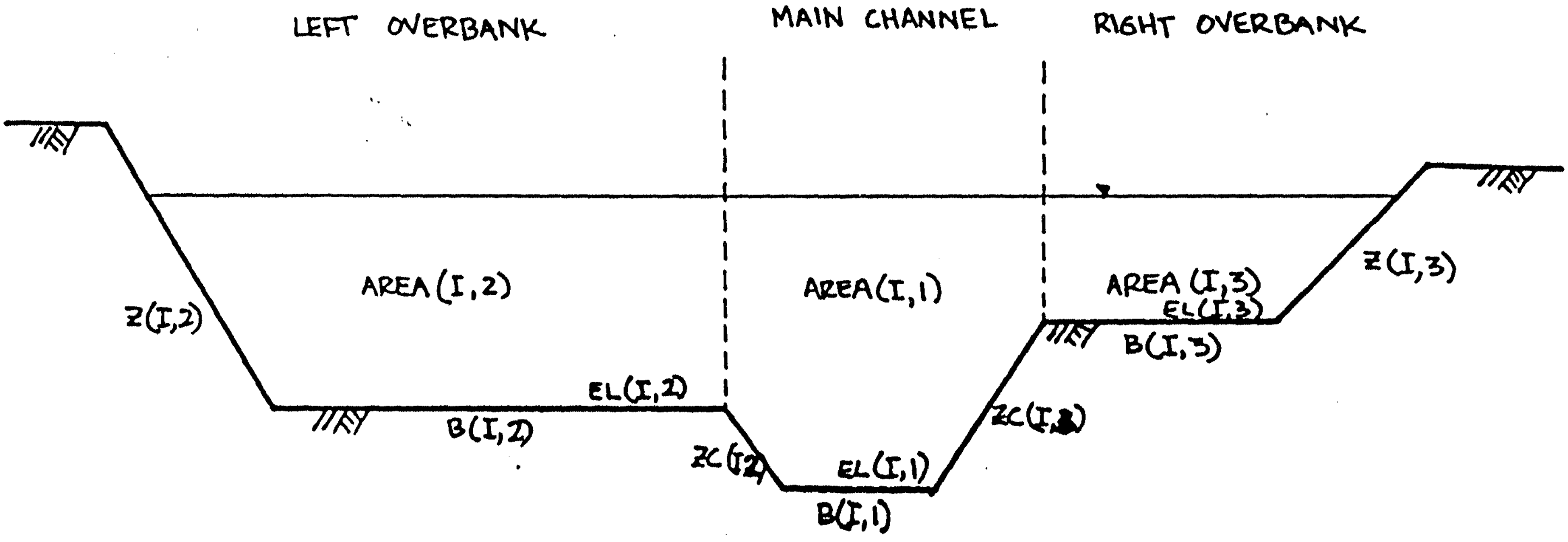
$K_i = \frac{1.486}{n_i} A_i R_i^{2/3}$ $\quad R_i = \frac{A_i}{P_i}$ $\quad$ (i FROM 1 TO 3)

$$Q_T = K_T S_f^{1/2}$$

$$S_f = \left(\frac{2Q}{K_1+K_2}\right)^2$$

$$h_f = S_f L$$

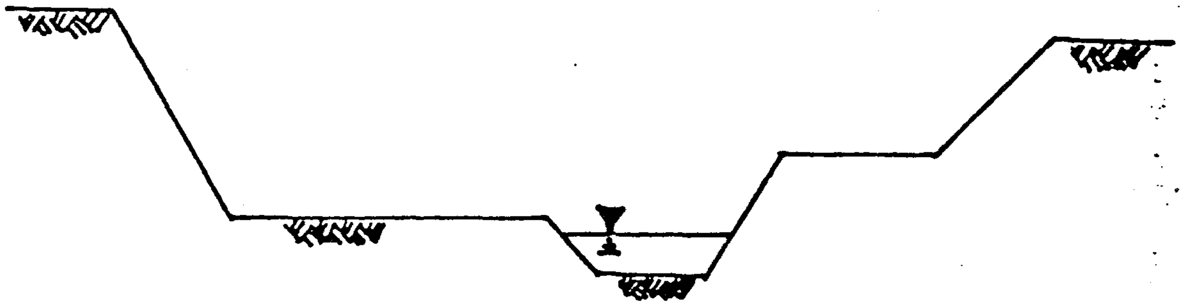
$$\alpha = \frac{(\Sigma A_i)^2 \Sigma (K_i^3/A_i^2)}{(\Sigma K_i)^3}$$



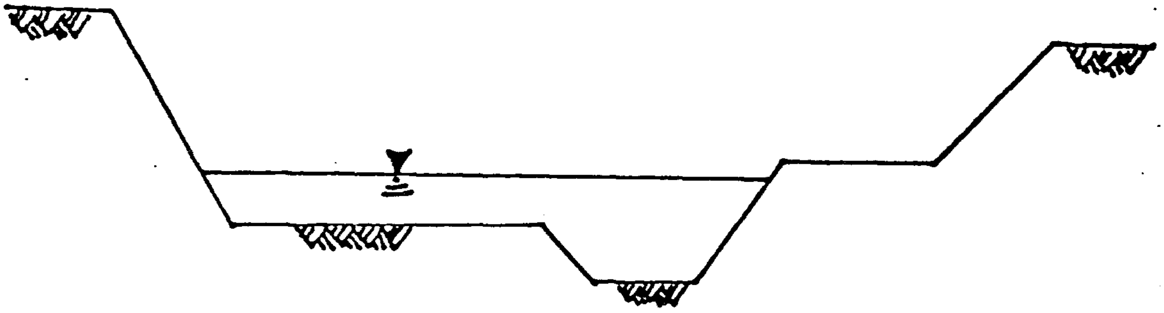
GENERAL VARIABLE FORM

AREA (I,J)
Z (I,J)
B (I,J)
EL (I,J)

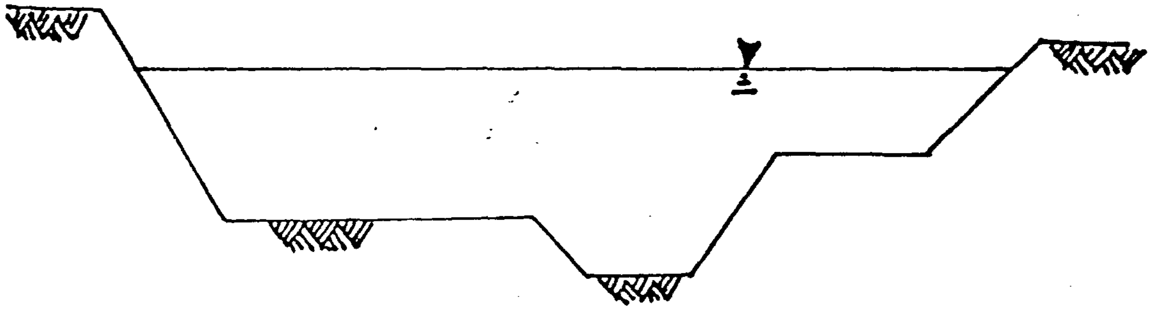
I = STATION 1 OR 2
J = CHANNEL SUBSECTION



CASE 1. $EL(I,2) > WS < EL(I,3)$



CASE 2. $EL(I,2) < WS < EL(I,3)$
OR $EL(I,2) > WS > EL(I,3)$



CASE 3. $EL(I,2) < WS > EL(I,3)$

DATA FILE

Required Data Format

DATA STATEMENTS MUST BE IN THE FOLLOWING SEQUENCE:

DATA STATEMENT	TYPE	PURPOSE
1.	Alpha	Heading
2.	Alpha	Subcritical or Supercritical
3.	Numeric	Station Geometry and Begin Dept
4 through N	Numeric	Station Geometry

DATA STATEMENT 1 (Heading)

```
15000 DATA PROJECT$, HANDLE$, DATE$
```

DATA STATEMENT	ELEMENT	VARIABLE	DESCRIPTION
1	1	PROJECT$	Name of Watershed and Job (60 characters max.)
1	2	HANDLE$	Your Name
1	3	DATE$	Todays Date (no comments)

DATA STATEMENT 2 (Flow Mode)

```
15010 DATA MODE$
```

DATA STATEMENT	ELEMENT	VARIABLE	DESCRIPTION
2	1	MODE$	SUBCRITICAL or SUPERCRITIC

DATA STATEMENT 4-n (Next Station)

```
15030 DATA STA2, Q, B(2,1), B(2,2), B(2,3), EL(2,1), EL(2,2), EL(2,3), N(2,1), N(2,2), N(2,3),
           Z(2,2), Z(2,3), ZC(2,1), ZC(2,2), C
```

DATA STATEMENT	ELEMENT	VARIABLE	DESCRIPTION
4-n	1	STA2	Station (ft.)
4-n	2	Q	Flow (cfs)
4-n	3	B(2,1)	Bottom Width Main Chan. (ft.)
4-n	4	B(2,2)	Bottom Width Left Overbank (ft.)
4-n	5	B(2,3)	Bottom Width Right Overbank (ft.)
4-n	6	EL(2,1)	Inv. Elev. Main Channel (ft.)
4-n	7	EL(2,2)	Inv. Elev. Left Overbank (ft.)
4-n	8	EL(2,3)	Inv. Elev. Right Overbank (ft.)
4-n	9	N(2,1)	Manning's 'n' Main Channel
4-n	10	N(2,2)	Manning's 'n' Left Overbank
4-n	11	N(2,3)	Manning's 'n' Right Overbank
4-n	12	Z(2,2)	Side Slope Left Overbank
4-n	13	Z(2,3)	Side Slope Right Overbank
4-n	14	ZC(2,1)	Side Slope Left Main Channe
4-n	15	ZC(2,2)	Side Slope Right Main Chann
4-n	16	C	Form loss Coeficient

DATA STATEMENT 3 (First Station)

```
15020 DATA STA1,Q,D1,B(1,1),B(1,2),B(1,3),EL(1,1),EL(1,2),EL(1,3),N(1,1),N(1,2),N(1,3),
           Z(1,2),Z(1,3),ZC(1,1),ZC(1,2),C
```

DATA STATEMENT	ELEMENT	VARIABLE	DESCRIPTION
3	1	STA1	Station (ft.)
3	2	Q	Flow (cfs.)
3	3	D1	Beginning Depth (ft.)
3	4	B(1,1)	Bottom Width Main Chan. (ft.
3	5	B(1,2)	Bottom Width Left Overbank (ft.
3	6	B(1,3)	Bottom Width Right Overbank (ft.
3	7	EL(1,1)	Inv. Elev. Main Channel (ft.)
3	8	EL(1,2)	Inv. Elev. Left Overbank (ft.)
3	9	EL(1,3)	Inv. Elev. Right Overbank (ft.)
3	10	N(1,1)	Manning's 'n' Main Channel
3	11	N(1,2)	Manning's 'n' Left Overbank
3	12	N(1,3)	Manning's 'n' Right Overbank
3	13	Z(1,2)	Side Slope Left Overbank
3	14	Z(1,3)	Side Slope Right Overbank
3	15	ZC(1,1)	Side Slope Left Main Channel
3	16	ZC(1,2)	Side Slope Right Main Channe
3	17	C	Form Loss Coeficient

OVER K

Project

Name L

Sub _ Super _

"This Worksheet Begins on Data Statement #3

	Station	Flow	Begin Depth	Bottom Width main channel	Bottom Width Left overbank	Bottom Width Right overbank	Invert Elevation main channel (datum)	Invert Elevation Left overbank	Invert Elevation Right overbank	Manning's "n" main Channel	Manning's 'n' Left overbank	Manning's "n" Right Overbank	Side Slope left overbank	Side Slope Right overbank	Side Slope Left main Channel	Side Slope Right main Channel	Form loss Coeficient

Attachment 1 to O & M Agreement

Plan of Operation and Maintenance for Llagas Creek, Reach 3A-5

This Plan of Operation and Maintenance will cover each of the items listed below. The actions will be performed by the sponsors unless otherwise noted.

I. OPERATION ITEMS	ACTION

There are no operation items in this plan.

II. MAINTENANCE ITEMS

All repair or replacement shall meet or exceed contract specifications.

A. Grouted Rock Riprap	Grouted Rock Riprap shall be maintained and cleaned; if removed or destroyed, or if any parts become unserviceable they shall be replaced. Weepholes shall be maintained in an operating condition at all times.
B. Channels	Erosion of streambeds shall be maintained within acceptable limits. Occasional slips and slumps of the channel banks shall be repaired. Repairs shall be to original line, grades, and elevations and shall be performed following significant flow events. Sediment and debris shall not be allowed to accumulate. Sediment and debris removal from the channel shall be staged to comply with required permits. Areas of scour in the low flow channel or other areas with recurring scour shall be filled to grade with course gravel or rock, sized to withstand applicable velocities.

C.	Earth Embankments	Protective cover with shallow rooted plants shall be maintained to minimize erosion and rilling of slopes. Any portion of the original cross section lost due to erosion or other causes shall be replaced.
D.	Rock Drop Structures	Rock drop structures may require a higher level of maintenance than other maintenance items. These drop structures should be inspected for scour following major storms and repaired if needed.
E.	Maintenance Roads	The Maintenance Roads and Access Ramps shall be maintained at all times for use during inspection and maintenance.
F.	Rock Slope Protection	Any rock slope protection removed or destroyed shall be replaced.
G.	Vegetative Erosion Control Planting	Any area where the cover is disturbed, inadequate, or destroyed shall be reseeded and fertilized; except in areas where mitigation/landscaping is covered by a separate Plan of O&M. Fertilizer will be applied annually between October 1 and November 30 at the rate of 250 pounds per acre as determined by the annual Operation and Maintenance inspection. If mowing is found to be necessary, the planting will not be mowed or cut until after viable seed has developed in a majority of the plants. Any mowing or cutting will not be closer than 4 inches above the ground surface.
H.	Woody Plantings	Destroyed, diseased, or dead plants will be replaced with the same species or an equivalent plant. Fertilizer will be applied as determined by the O&M inspection.

	If weed control is necessary, proper application of herbicides or manual weed removal will be done such that established plants are not destroyed.
I. Local Drainage Inlets	The local drainage inlets shall be maintained; if removed or destroyed, or if any parts become unserviceable, they shall be replaced.
J. Fencing	Fencing alignment, height, and condition shall be maintained as constructed.

III. Total Estimated Annual O&M Costs are $________per mile.

IV. METHOD OF FINANCING

Santa Clara Valley Water District funds will be used for operation and maintenance costs including contingencies.

V. INSPECTION AND REPORTS

A. Each June during the life of the measure (50 years) there will be a field inspection and report by the sponsors. Representatives of the Soil Conservation Service (SCS) will assist the Sponsors in making the inspection. Additional joint inspections will be conducted after unusual events.

B. All maintenance items will be inspected with particular emphasis to the following critical items:

(1) Grouted Rock Riprap

(2) Channels including channel banks and removal of sediment and debris

(3) Vegetative Cover for erosion control

C. A written report will be made of each inspection. A copy of each report will be provided by the Sponsors to the SCS within 10 days of the date on which the inspection was made. This report will describe the conditions found and list any corrective action needed with an estimated time frame to complete each action.

VI. APPLICABLE LAWS AND REGULATIONS

Operations and maintenance work will be performed in a manner that complies with the environmental concerns in the Environmental Assessme state laws and regulations, and local laws and regulations.

VII. LENGTH OF PLAN

This plan will remain in effect for 50 years following the date of acceptance of the last unit of the project by the Sponsor.